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NUTRITION LITERACY STATUS OF ADOLESCENT STUDENTS IN KAMPALA DISTRICT, UGANDA

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May God bless you all.

Ndahura Nicholas Bari,

Oslo and Akershus University College of Applied Sciences,

Lillestrøm, Norway.

Dedication

This thesis is dedicated to Campagna Giovanbarone, a truly great Italian I was privileged to have known and Nyakaisiki Elizabeth the angel in my life.

Abstract

Background and aim: General literacy though significant is not sufficient to address the health related challenges of both the developed and developing world. And health, nutrition illiteracy may be contributing to the disease burden of poor communities and countries and reinforcing the already existing health and economic inequalities (Kickbusch, 2001; Lino, Basiotis, Anand, & Variyam, 1998; Silk et al., 2008). Health literacy can be defined as those skills needed to navigate successfully through today's complex health care systems and health messages and information (Bernhardt, Brownfield, & Parker, 2005). Nutrition literacy can be defined as the degree to which individuals have the capacity to obtain, process and understand basic nutrition information. Nutrition literacy can be classified into three levels of functional, interactive and critical nutrition literacy. Functional nutrition literacy (FNL) can be defined as the extent to which an individual experiences difficulty in understanding and comprehending nutrition messages. Interactive nutrition literacy (INL) can be defined as the cognitive and interpersonal skills needed to manage nutrition issues in partnership with professionals. Critical nutrition literacy (CNL) can be defined as ability to analyse nutrition information critically, increase awareness, and participate in action to address barriers (Pettersen, Kjøllesdal, & Aarnes, 2009a; Silk et al., 2008). Therefore, the purpose of this study was to determine the nutrition literacy status of adolescent students in Kampala District in Uganda. And it was hoped that this study would provide a foundation for further exploration in nutrition literacy within the context of adolescent nutrition.

Materials and methods: The study was cross-sectional in nature and conducted in Kampala district, Uganda with a total of 506 adolescent participants. The questionnaire used consisted of 29 attitude statements adapted from Pettersen et al. (2009a). They were grouped under sub-themes of functional, interactive and critical nutrition literacy. The questionnaire also included questions about confidence in seeking nutrition information, barriers to seeking nutrition information and level of trust in various sources of nutrition information adapted from the Health Information National Trends Survey (HINTS) and a study by Zoellner, Connell, Bounds, Crook, and Yadrick (2009). Exploratory factor analysis (EFA) and internal consistency reliability assessed using the Cronbach's coefficient alpha were performed in order to establish the possible constructs. Multiple regression analysis was also performed to examine the degree to which the independent variables could contribute to explaining the variance (R^2) in the dependent variables (nutrition literacy constructs) and, also, which of the independent variables were significant ($p \leq .05$) predictors of this variance and to what extent. An independent-samples t-test and correlation analysis was also performed on the data. All *p*-values were 2-tailed at 95% confidence level.

Results: EFA led to the development of seven nutrition literacy constructs: *FNL*, *INL*, *INL**discuss***, *CNL**action***, *CNL**media***, *CNL**influence*** and a *GrandNL*. Average scores indicated that the adolescent students had moderate levels of *FNL*, *INL*, *INL**discuss***, *CNL**action***, and *GrandNL* but low levels of *CNL**media*** and *CNLi**nfluence***. Trust in newspapers or magazines, friends, family, government health agencies, international organisations, health personnel, nutritionists or dieticians and gender contributed to the variance of the nutrition literacy constructs. The most searched sources for information about nutrition, diet or food were: books, newspapers, health care providers and family members respectfully. The lack of nutrition information in other languages apart from English was cited as the major barrier to seeking nutrition information.

Conclusion: The results suggest that the adolescents most likely have the basic skills required to comprehend and follow nutrition messages. And also the interpersonal skills needed to manage nutrition issues in collaboration with other individuals. However, the low scores for both the *CNL**media*** and *CNL**influence*** constructs probably imply that they are unlikely to evaluate nutritional claims made by media basing on sound scientific principles. This could imply that they are more likely to make poor nutrition related choices basing on the information obtained from the various media channels and that their dietary habits are easily influenced by other individuals and the media. However, there is still need for the development and improvement of tools that can accurately assess the nutrition literacy of individuals in public health settings.

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Operational definitions

*CNL**action***	A construct measuring an individual's willingness to take action to improve nutritional aspects ranging from a personal level, national and international level.
*CNL**influence***	A construct measuring the extent to which an individual's dietary habits can be influenced by other individuals and media.
*CNL**media***	A construct measuring an individual's ability to evaluate nutritional claims made by media basing on sound scientific principles.
FNL	A construct measuring the extent to which an individual experiences difficulty in understanding and comprehending nutrition messages.
GrandNL	A construct measuring an individual's overall nutrition literacy.
INL	A construct measuring an individual's interpersonal skills needed to manage nutrition issues in collaboration with other individuals.
*INL**discuss***	A construct measuring an individual's willingness to discuss nutrition issues with other individuals.

List of acronyms and abbreviations

AIDS	Acquired Immunodeficiency Syndrome
BMI	Body Mass Index
CCA	Cronbach's Coefficient Alpha
CNL	Critical Nutrition Literacy
DV	Dependent Variable
EFA	Exploratory Factor Analysis
e.g.	For example
FNL	Functional Nutrition Literacy
GrandNL	Grand Nutrition Literacy
HALS	Health Activities Literacy Scale
HBSC	Health Behaviour in School-aged Children
HINTS	Health Information National Trends Survey
HIV	Human Immunodeficiency Virus
INL	Interactive Nutrition Literacy
IOM	Institute of Medicine
IV	Independent Variable
KMO	Kaiser-Meyer-Olkin
LEP	Limited English Proficiency
M	Sample mean
MOE	Ministry of Education and Sports
n	Number of respondents
N	Sample size
No.	Number

NALS	National Adult Literacy Survey
NLS	Nutrition Literacy Scale
NLQ	Nutrition Literacy Questionnaire
NVS	Newest Vital Sign
PCA	Principal Components Analysis
r	Estimate of the Pearson product-moment correlation coefficient
R	Coefficient of multiple correlation
R^2	Coefficient of determination
REALM	Rapid Estimate of Adult Literacy in Medicine
rho	Spearman rank order correlation
SAT	Scholastic Aptitude Test
SD	Standard Deviation
SES	Social Economic Status
SPSS	Statistical Package for Social Sciences
S-TOFHLA	Short Test of Functional Health Literacy in Adults
TOFHLA	Test of Functional Health Literacy in Adults
UNCST	Uganda National Council of Science and Technology
UNESCO	United Nations Educational Scientific and Cultural Organization
UNICEF	United Nations Children's Education Fund
UK	United Kingdom
US	United States
WHO	World Health Organization
WRAT-R3	Wide Range Achievement Test-Revised 3
β	Standardized beta coefficient

1. Introduction

1.1 Background to the study

There has been a change of patterns related to diet and health globally. Certain lifestyle behaviours and eating habits initially among more affluent, more industrialised nations are gradually growing among developing nations such as Uganda. This has led to a shift from a high prevalence of both infectious/communicable diseases and under-nutrition to a situation where, not only are non-communicable diseases and over-nutrition (overweight and obesity) on the increase but also predominant. This shift has been referred to as the *nutrition transition* (Haddad, 2005). The high prevalence of non-communicable diseases and over-nutrition is not only evident among adults but also among adolescents (Manganello, 2008).

Adolescence is a period within which an individual (adolescent) between 10-19 years of age not only undergoes major psychological and physical changes but also changes in their social interactions and relationships (Brug & Klepp, 2007; WHO, 2009). During adolescence there is need for adequate nutrient intake so as to cover both nutrient and energy requirements for maintenance but also for the increased nutrient needs required for rapid growth and development associated with puberty, this is vital because the adverse health consequences of both under-nutrition and over-nutrition during this period can be severe and may not always be fully reversible (Brug & Klepp, 2007). However, eating habits may be less established in childhood and adolescence and may therefore be more modifiable and thus healthy food habits adopted in adolescence may track into adulthood (Brug & Klepp, 2007).

There is an epidemic of overweight[1] and obesity[2] among adolescents in the world today with children developing obesity related conditions previously mostly confined to adults (Carroquino, 2009; WHO, 2009). The aetiology and consequences of adolescent obesity are diverse but it has usually been linked to unhealthy eating habits and a lack of physical exercise

[1] Excessive accumulation of body fat, but not so great as to be classified as obesity (Bender, 2009).

[2] Obesity is a condition of excessive body fat accumulation to a level that increases the risk of complicating diseases such as diabetes, high blood pressure among others. Many theories have been put forward to explain the cause/s of obesity, such as energy input imbalance, cultural and psychological influences, physiologic regulatory mechanisms and the environment; although no single theory can completely explain all the manifestations of obesity or apply consistently to all individuals (Mahan, Escott-Stump, & Krause, 2004). The prevalence of obesity has drastically increased in many countries since the 1980s, and the numbers of those affected continues to increase (Astrup, 2005).

(Hagarty, Schmidt, Bernaix, & Clement, 2004). Globally, nutrition related chronic diseases such as diabetes mellitus (type II diabetes), hypertension and cardiovascular diseases, micronutrient deficiencies and poor eating patterns and lifestyles are some of the main nutrition related issues among adolescents (Brug & Klepp, 2007).

The Health Behaviour in School-aged Children (HBSC) 2005/2006 survey found out that the prevalence of overweight including obesity among countries was varied. However, the rates among 11 and 13 year olds ranged between 5% to more than 25% in some countries that were surveyed compared to the 2001/2002 HBSC survey, the situation does not seem to be improving despite the increased awareness and the development of efforts aimed at reducing overweight and obesity (Carroquino, 2009). Data about overweight and obesity among adolescents in developing countries most especially in Sub-Saharan Africa is still limited. However, data from ten developing countries shows that between 21-36% of girls aged 15-19 are overweight (UNICEF, 2011). This therefore emphasises the need for continued support and commitment towards the development and implementation of measures towards the reduction of overweight and obesity among children and adolescents, however in order to develop and implement effective nutrition promoting interventions among adolescents, there is need to first identify and understand the nutrition related problems and behaviours among adolescents such as their dietary habits (Brug & Klepp, 2007).

According to Brug and Klepp (2007), adolescents' food choice becomes more autonomous during adolescence and dietary habits acquired during this period can affect the risk of chronic disease in three ways:

- During adolescence, the development of risk factors such as being overweight, increased blood pressure can occur.
- The developed risk factors can progress throughout the life of the individual.
- The eating habits developed during puberty either 'good' or 'bad' tend to be maintained throughout an individual's life span.

The adolescence period therefore provides a window of opportunity that can be utilized by health promoters to lead to the adoption of healthy behaviours that can help prevent the development of health problems later on in adulthood. For example: healthy behaviours such as physical activity and intake of fruits and vegetables can be adopted during adolescence and thus reduce the risk of becoming obese and developing obesity/overweight related diseases such as

type II diabetes and cardiovascular diseases later on in life (WHO, 2009). One of the ways of understanding some of the reasons behind the nutrition related problems and behaviours among adolescents is by assessing their nutrition literacy levels.

Nutrition literacy can be defined as the degree to which individuals have the capacity to obtain, process and understand basic nutrition information. Nutrition literacy can be classified into three levels of functional, interactive and critical nutrition literacy (Pettersen et al., 2009a; Silk et al., 2008; Zoellner et al., 2009). Therefore by assessing their nutrition literacy levels this will ensure the development and implementation of evidence based interventions that are more likely to be successful.

1.2 Statement of the problem

Unhealthy diets coupled with low levels of physical activity, economic and social factors are some of the major contributors to the prevalence of overweight and obesity. Though no study has been done regarding nutrition literacy rates among adolescents in Uganda, research done in the USA revealed that 44% of male adolescents and only 27% of female adolescents met the minimum average daily goal of at least five servings of vegetables and fruits (Silk et al., 2008). And nutrition literacy has been cited as one of the reasons for the differences in diet because individuals with higher nutrition literacy are more likely to have healthy eating practices as they are more aware of the link between poor diet and certain disease. Therefore, general literacy though significant is not sufficient to address the health related challenges of both the developed and developing world, and high levels of health, nutrition illiteracy may be contributing to the disease burden of poor communities and countries and reinforcing the already existing health and economic inequalities (Kickbusch, 2001; Lino et al., 1998; Silk et al., 2008). Therefore, the purpose of this study was to determine the nutrition literacy status of adolescent students in Kampala district in Uganda.

1.3 Aim of the study

The overall aim of the study was to determine the level of nutrition literacy among the adolescent students in Kampala district, Uganda. Research questions were used to realise the aim of the study.

1.3.1 Sub-aims of the study

I thought it also important and interesting to find out the following aspects among the adolescent students:

a) Types of media channels used in seeking nutrition related information.
b) How confident they were in seeking nutrition-related advice or information.
c) Levels of trust in various nutrition information sources.
d) Barriers they face in seeking nutrition information.

Some of the aspects mentioned may not be directly linked to the overall aim of the study but I do believe that they offer some insight into the interactive and critical nutrition literacy of the adolescent students.

1.4 Research questions

A total of three research questions were used to realise the aim of the study. The research questions were as follows:

1. What are the levels of functional nutrition literacy, interactive nutrition literacy and critical nutrition literacy among the adolescent students?
2. Are there any differences in the mean nutrition literacy scores between the male and female adolescent students?
3. What are the significant predictors (independent variables) of the fraction of total variance in the nutrition literacy constructs (as the dependent variables) among the adolescent students?

2. Theory

2.1 Introduction

In order to discuss the concept of nutrition literacy, it is vital that a general understanding of literacy and health literacy is established. This chapter defines and reveals the current understanding of literacy and health literacy. However, no attempt has been made to fully trace the evolution of *literacy* and *health literacy* as concepts or practice as that would be beyond the scope of this thesis.

2.2 Literacy

The definition of literacy[3] not only influences the goals, strategies and programmes developed and adopted by policy makers but can also determines how progress towards reducing illiteracy is monitored and assessed (UNESCO, 2004). "*Literacy is about more than reading and writing, it is about how we communicate in society. It is about social practices and relationships, about knowledge, language and culture*" (UNESCO, 2003, p. 1).

For long literacy was defined as just having the skills of reading and writing and arithmetic, (the three R's). However, in the 1970's Paulo Freire experimented with new literacy methods were learners were seen as actors and subjects and not just beneficiaries of the learning process. In the 1980's further elaboration of literacy theory was made and a distinction was made between *autonomous literacy* and *ideological literacy*; autonomous implying that a skill is considered independent of values and context and ideological implying a practice necessarily defined by the social and political context (Kickbusch, 2001; UNESCO, 2003).

The definition of the Centre for Literacy of Quebec can be considered a current definition of literacy in the 21st century. Literacy is a complex set of abilities needed to understand and use the dominant symbol systems of a culture such as alphabets, numbers, visual icons, for personal and community development. In today's world, literacy is not limited to the functional skills of reading, writing, speaking and listening but also comprises of multiple literacies such as visual,

[3] It is from the UNESCO recommendation of 1958 regarding the international standardization of educational statistics where the first agreed international definition of literacy stems from. It states that a literate individual is one who can, with understanding, both read and write a short simple statement about his or her everyday life (UNESCO, 2004).

media, and information literacy, which focus on the capacity of individuals to use and make critical judgements about the information they encounter daily (Centre for literacy, 2011).

Literacy has also been used metaphorically for certain competencies in various domains such as skills in health literacy, computer literacy and eco-literacy (UNESCO, 2004). However literacy may be defined, literacy affects every aspect of an individual's life and the entire community (Centre for literacy, 2011).

According to Kickbusch (2001), literacy is being seen to include a number of skills needed for an individual to function in society. The Canadian Education Research Information System has come up with a list of six such skills:

- Quantitative literacy
- Scientific literacy
- Technological literacy
- Cultural literacy
- Media literacy
- Computer literacy

According to Kickbusch (2001), she suggests that health literacy be included in this list of which I do agree with her. However, I do suggest that nutrition literacy also be included. The reason for this suggestion is that it is a well-established fact that there is a significant link between nutrition, health and disease as there is increasing scientific evidence that changes in diet have strong effects both positive and negative on health throughout life, thus making nutrition a major modifiable determinant of chronic disease (WHO, 2003). Although most often health is considered synonymous with disease and nutrition is not.

2.2.3 A conceptual model of literacy

From UNESCO's definition of literacy, it is clear that literacy as a concept is complex and no longer only about reading and writing but also includes the social environment (Cimbaro, 2008).

Literacy is comprised of three components namely: language, action and ecology. These components are interconnected and influence each other. However, they are also influenced and affected by the social environment (politics, culture and history) (Cimbaro, 2008). This interconnectedness is illustrated in Figure 1.

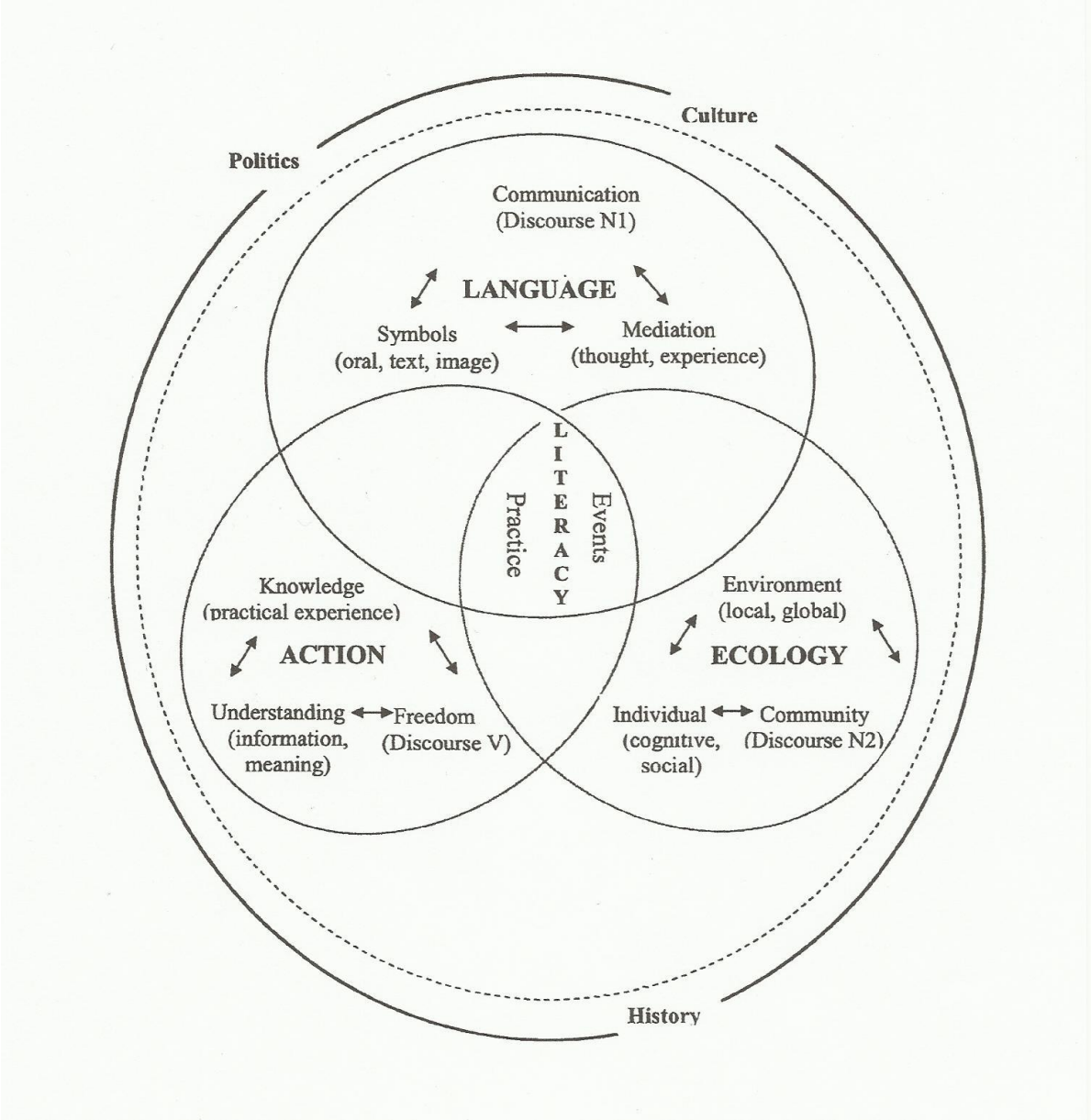

Figure 1. Model of literacy (Cimbaro, 2008).

The interconnectedness illustrated in Figure 1 is further explained below:

Literacy is language. Language is made up of symbolic (oral, written, image) mediated (using language to connect thought and experiences) communication (the process of understanding and sharing meaning). Literacy in this sense is discourse (noun1). Discourses can involve one way path communications (as in a pamphlet), two way path communications (as in an email conversation), or transactional communication path (face to face conversation) (Nelson & Pearson, 1992). Language is influenced culturally (by religion, ethnicity, social class, etc.) politically (by the power structures that create texts and who are allowed to interpret it and use it) and historically (by being positioned

as a historical act in a particular written text which can be accessed at any time). The language culture of the community (oral or textual) will also influence how the symbols or words are created, the meaning given to the words, how they are stored and accessed. Communication technologies also determine how meaning is coded or presented, or who has access to it (video, email etc.) (Cimbaro, 2008, p. 40).

Literacy is action. Through the use of language, humans create individual meanings about their environment from their daily experiences. Through community interaction, people establish common understandings and world views. These common understandings and daily experiences create knowledge about the world they live in. The freedom to learn and use language to create and access knowledge, gives individuals and communities the power to choose the action that best helps them meet their goals. Literacy allows for the analysis of language, as well as, cultural, historical and political structures that might interfere with people's ability to freely choose how they live and also foster the necessary changes to freely act. Literacy in this sense in discourse (verb) (Cimbaro, 2008, p. 41).

Literacy is ecological. Human systems (individual and communities) and their environments are interconnected and interdependent for their survival. Communication, through language, facilitates the creation and sharing of knowledge for survival. Language is socially constructed by individuals during interactions at home, at school, at work and during leisure activities, and further constructed by the use of many different language technologies - televisions, radio, newspapers, cell phones, computers, etc. Language use and development is dependent on the individual's ability to acquire the basic skills and meanings of the language as established by the community, and the community is dependent on the individual to create new symbols and meanings, so that people can adapt to changing environments. Literacy in this sense is discourse (noun2). As well, a person's ability to use language is based on his/her identity-who s/he is culturally, historically and politically, which in turn effects the interaction between them the community and the environment (Cimbaro, 2008, p. 41).

2.2.4 Conceptual model of adolescent literacy

The conceptual model of adolescent literacy below, developed by Carnahan and Cobb (2004) shows how the literacy of adolescents can be influenced by various factors.

Figure 2. Model of adolescent literacy (Carnahan & Cobb, 2004).

2.2.4.1 Perceptions

Climate: is the learning environment such as a school, classroom. This environment is affected by the systems, relationships within it, and the goals of both individuals and the entire group (Carnahan & Cobb, 2004).

Trust: is the reliance on each other, the teacher trusting the student and the student trusting the teacher this creates an expectation and belief in success (Carnahan & Cobb, 2004).

Investment: is the process of committing time and support for learning to occur by both teachers and students. This leads to the expectation of return such as personal satisfaction or higher achievement (Carnahan & Cobb, 2004).

Motivation: comprises of two categories; intrinsically motivated students who are engaged for the sense of enjoyment and a sense of accomplishment with the learning assignments or just for the sake of learning. And extrinsically motivated students are engaged to

either obtain a reward or avoid punishment. However, the rewards and punishments may not be directly linked to the learning process (Carnahan & Cobb, 2004).

Engagement: students that are engaged (identifying with and participating in both academic and non-academic activities within the educational environment) develop a feeling of belonging and develop positive relationships with each other and with the teachers (Carnahan & Cobb, 2004).

2.2.4.2 Programs

Patterns for learning: these comprise of dynamic and flexible grouping practices used in classrooms. The grouping practices however depend on the purpose for learning and the needs of the learners (Carnahan & Cobb, 2004).

Instructional management & materials: instructional management is the system used within a classroom to facilitate maximum learning while instructional materials are any materials that are used to enhance and expand the learning process (Carnahan & Cobb, 2004).

Evaluation: includes the routine examination of programs to determine their efficacy for all learners. An example of an evaluation method is the use of student test scores (Carnahan & Cobb, 2004).

2.2.4.3 Achievement

Standards: these are what students are expected to know, understand, and be able to perform. A standards led instruction approach brings what is to be learned into focus and holds learning as a constant, while treating other traditional constants such as time, location and instructional materials as variables (Carnahan & Cobb, 2004).

Assessment: assessment is diagnostic, formative and summative and serves as a screening device that helps teachers with information they need to improve student learning. Some sources of data for assessment include: formal and informal observations, daily work and standardized test scores. All of which can be used as data points for assessing student performance (Carnahan & Cobb, 2004).

Relevance: there should be logical connections between what is being taught and how students are learning. Relevant learning prepares students to be useful and productive members of a global society (Carnahan & Cobb, 2004).

Organization for learning: this applies to the system operating beyond the classroom level such as block scheduling, departmentalization, and lesson schedules, all of which play a role in the effective organization for learning and have an impact on achievement of the learning objectives (Carnahan & Cobb, 2004).

2.2.4.4 Demographics

English language learners: this refers to students whose first language is not English. Thus may be unable to speak, read, comprehend, or write fluently in English which can eventually affect their performance and achievement (Carnahan & Cobb, 2004).

Individualized education program students: these are students that have been formally identified to have a range of disorders that have an impact and interfere with the acquisition and use of their listening, speaking, reading, comprehension, and writing skills. (Carnahan & Cobb, 2004).

Socio-economic status: this refers to the income level, occupation, and/or education level of the student's family. As usually there is a correlation but not causation, between low social economic status (SES) and lower reading abilities and limitations with vocabulary (Carnahan & Cobb, 2004).

Ethnicity and race: this refers to the traits of a specific cultural heritage. Ethnicity is not limited to language but also includes the traditions, customs, values, and beliefs of a given group of individuals (Carnahan & Cobb, 2004).

2.2.5 The link between literacy and health

There is definitely a link between literacy and health (American Medical Association, 1999; Grosse & Auffrey, 1989). Literacy is an important first step in the learning process that helps an individual learn new ideas and creates a basis for better understanding and an interest to learn more (Fjortoft, 1999). Literacy affects an individual's ability to access, seek medical attention, follow instructions from health personnel, take his or her medication correctly, comprehend disease-related information, and learn about disease prevention and self-management. According to the organisation Partnership for Clear Health Communication[4],

[4] See link: http://www.ama-assn.org/ama/pub/about-ama/ama-foundation/our-programs/public-health/health-literacy-program/partnerships.page (American Medical Association, 2012). Accessed: 24th March 2012.

"*Literacy skills predict an individual's health status more strongly than age, income, employment status, education level and racial or ethnic group*" (as cited in Wilson, 2003). This is evidenced in several studies (Kalichman & Rompa, 2000; Schillinger et al., 2002; Williams, Baker, Honig, Lee, & Nowlan, 1998a). However, most significant of all, an individual with low literacy is at an increased risk of having a poor health status and of dying of chronic and communicable diseases (Nutbeam, 2008; Weiss & Johnson, 2008; Wilson, 2003).

2.2.6 Health literacy

Health literacy is a concept that can be considered both new and old (Ozdemir, Alper, Uncu, & Bilgel, 2010). The term health literacy can be traced as far as 1974 (Mancuso, 2009). However, its definition has been a source of confusion and debate as researchers, authors and experts have failed to come up with a common terminology (Baker, 2006; Logan, 2007; Peerson & Saunders, 2009). However, several definitions of health literacy do exist.

Bernhardt et al. (2005), suggest that health literacy are those skills needed to navigate successfully through today's complex health care systems and health messages and information. "*The term health literacy was first used in 1974 monograph by Simonds that described how health information impacts the education system, health care system and mass communication*" (Bernhardt et al., 2005, p. 4).

WHO (1998, p. 10), mentions that "*health literacy represents the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health*".

> *Health literacy implies the achievement of a level of knowledge, personal skills and confidence to take action to improve personal and community health by changing personal lifestyles and living conditions. Thus, health literacy means more than being able to read pamphlets and make appointments. By improving people's access to health information, and their capacity to use it effectively, health literacy is critical to empowerment. Health literacy is itself dependent upon more general levels of literacy. Poor literacy can affect people's health directly by limiting their personal, social and cultural development, as well as hindering the development of health literacy.* (WHO, 1998, p. 10).

However, a more recent definition is:

> *Health literacy is linked to literacy and entails people's knowledge, motivation and competences to access, understand, appraise, and apply health information in order to make judgments and take decisions in everyday life concerning healthcare, disease prevention and health promotion to maintain or improve quality of life during the life course* (Sorensen et al., 2012).

The report from the Institute of Medicine (2004), states that health literacy is the bridge between literacy skills, abilities of the individual and the health context. The IOM definition is conceptualised as shown in Figure 3. Literacy is the foundation of health literacy as it provides the necessary skills such as reading, writing, basic mathematics, speech, and speech comprehension skills that enable an individual to understand and communicate health information. And health literacy is the active mediator and bridge between the individual and health contexts, this association eventually leads to health-related outcomes.

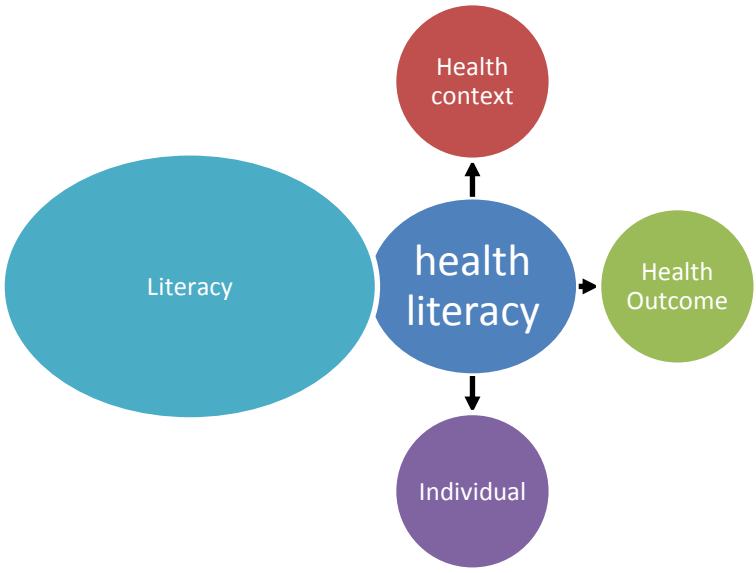

Figure 3. Conceptual model of health literacy[5] (Institute of Medicine, 2004).

Baker (2006), says that health literacy is dynamic and an individual's health literacy varies depending upon the health care provider, system of care and medical condition being treated. He puts forward a conceptual model of the domains of health literacy and the relationship between individual capacities, health-related print and oral literacy and health

[5] Model developed by author of thesis

outcomes. He hopes that this model (see Figure 4) will be a stepping stone in the process of achieving a shared definition of health literacy.

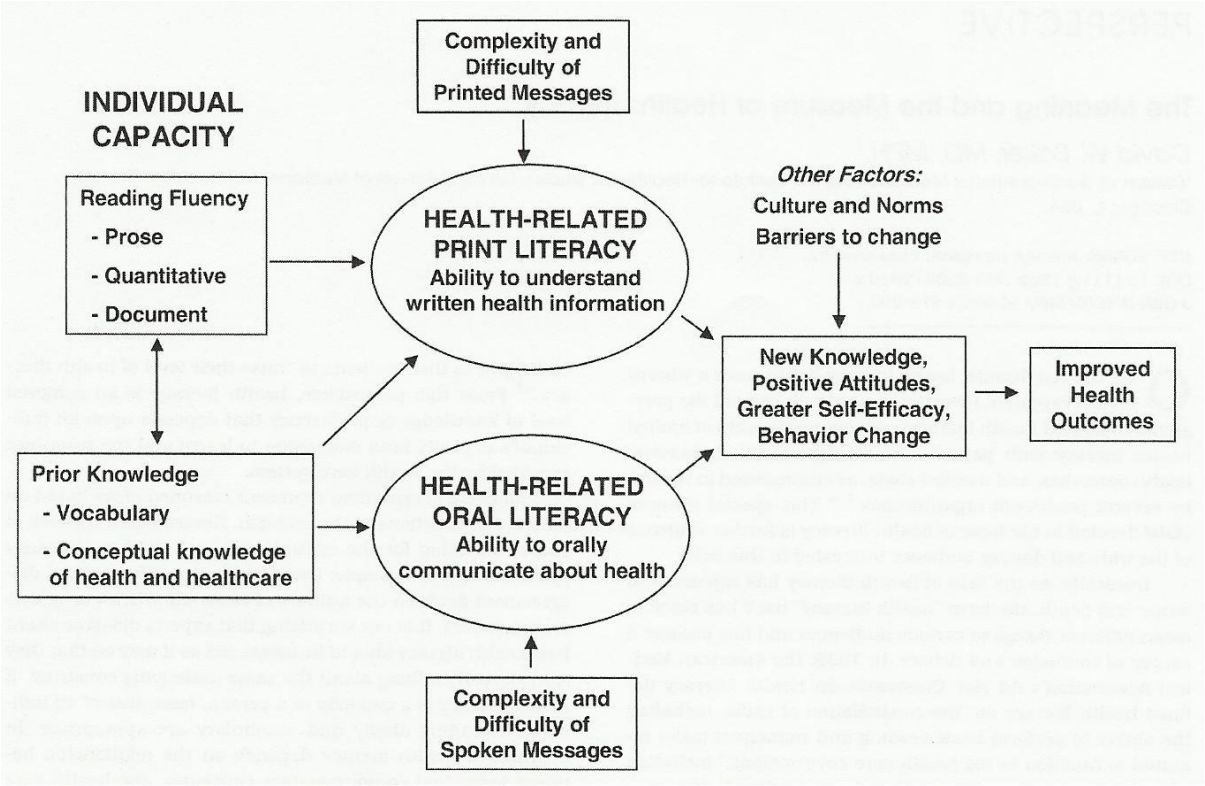

Figure 4. Conceptual model of the relationship between individual capacities, health-related print and oral literacy and health outcomes (Baker, 2006).

As shown in Figure 4, Baker's model first focuses on two sub-domains of individual capacity namely reading fluency and prior knowledge. Reading fluency allows a person to expand one's vocabulary and gain conceptual knowledge while prior knowledge is that knowledge an individual has before reading health-related materials or communicating to healthcare personnel. These two sub-domains are correlated and reinforce each other, as individual acquires his or her knowledge through reading and it is often easier to read and understand materials that contain words and concepts that are familiar.

The second domain is health literacy which is subdivided into health-related print literacy and health-related oral literacy. All of which depend on an individual's reading fluency, familiarity with health-related concepts and vocabulary, the complex and difficult health messages both printed and spoken that an individual encounters in the healthcare environment and other factors such as culture and social norms. This whole process eventually leads to the

acquiring of new health-related knowledge, better health behaviour, positive attitudes and finally improved health outcome (Baker, 2006).

2.2.6.1 A tripartite based model of health literacy

Nutbeam (2000) has criticized most of the definitions of health literacy of being 'narrow' and lacking deeper meaning. He however views health literacy as a tripartite model as shown in Figure 5 which he believes encompasses the broader spirit of the WHO's definition of health literacy (Gray, Klein, Noyce, Sesselberg, & Cantrill, 2005; Ishikawa, Nomura, Sato, & Yano, 2008a; McCray, 2005).

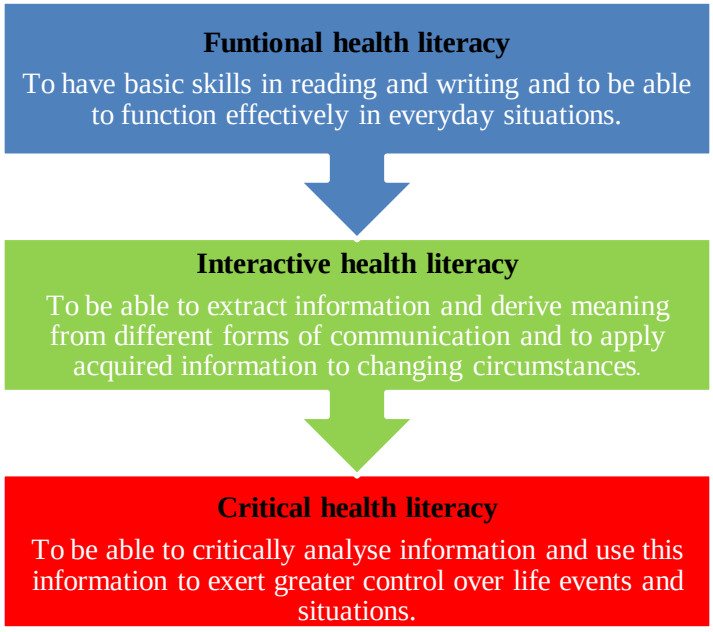

Figure 5. Tripartite model of health literacy (Nutbeam, 2000; Pettersen et al., 2009a).

2.2.6.2 An expanded model of health literacy

In the last ten years, a model of health literacy that focuses on an individual's ability to interact with health care providers has made advances in measuring and analysing the relationship between health literacy and health in the United States (Zarcadoolas, Pleasant, & Greer, 2005).

However, Zarcadoolas et al. (2005) suggest that the aspects of health literacy reach beyond reading skills and the understanding of science and media, therefore they propose an

expanded model of health literacy that is characterised by four domains of fundamental literacy, science literacy, civic literacy and cultural literacy. To them, a health literate person is not only able to use health concepts and information but also be able to participate in private and public dialogues about health. Thus health literacy is "*the wide range of skills and competencies that people develop to seek out, comprehend, evaluate and use health information and concepts to make informed choices, reduce health risks and increase quality of life*" (Zarcadoolas et al., 2005).

2.2.6.3 Health literacy and adolescents

Many of the studies about the impact of health literacy on an individual's health status have focused on the adult population, in particular the elderly and those suffering from long term health conditions such as diabetes. Even though some studies have been done regarding health literacy and adolescents (Chang, 2011; Chisolm & Buchanan, 2007; Davis et al., 2006; Fredriksen, 2010; Manganello, 2008; Wu et al., 2010). Not many health literacy studies have focused on adolescents. The thinking behind this could be that its assumed adolescents are less active in the decision making process regarding their health. However, some research shows the contrary (Gray et al., 2005).

2.2.6.4 Measurement of health literacy

According to Nutbeam (2009a)[6], health literacy can be regarded as a measurable outcome of health education. And its measurement can be best achieved when its content and context are properly defined as this will help bring together a more complete conceptualisation of health literacy. Health literacy can be measured at three hierarchical levels described as functional, interactive and critical health literacy. Some researchers who have done studies based on the three hierarchical levels include:

Ishikawa, Takeuchi, and Yano (2008b) who developed and examined the psychometric properties of a scale designed to measure the three levels of health literacy based on Nutbeam (2000) model namely: functional, communicative and critical health literacy in diabetic patients. Five items were used to assess the functional literacy of the patients (extent to which the patients

[6] Don Nutbeam was the Vice-Chancellor of the University of Southampton (UK) as of 2009. He was head of public health in the UK government department of health (2000-2003). His research interests have included public health intervention research in schools and communities as well as studies of health literacy and adolescent health behaviour.

experienced difficulty in reading the instructions or leaflets from hospital or pharmacies). For communicative health literary, five items were used to assess how the patients extorted and communicated diabetes-related information. Critical health literacy (degree to which the patients critically analysed the information and its use in decision making) was assessed using four items. The internal consistency of the functional, communicative and critical health literary scales was high (.84, .77, and .65 respectively). The scales were also moderately correlated to each other thus represented a different domain of health literacy abilities and skills. However, some researchers consider health literacy to be one dimensional mainly focusing on individual competences. On the other hand, others such as Nutbeam (2000) and Zarcadoolas et al. (2005) extend the concept of health literacy to include dimensions which go beyond individual competences. This lack of consensus about the conceptual dimensions of health literacy has limited the possibilities for measurement and comparison (Mårtensson & Hensing, 2012; Sorensen et al., 2012).

Ishikawa et al. (2008a) also did a study aimed at examining the psychometric properties of a brief measure to assess major components of communicative (interactive) and critical health literacy among Japanese office workers. Their findings supported the validity of the health literacy scale among office workers.

The most commonly used measures of health literacy are: the Rapid Estimate of Adult Literacy in Medicine (REALM) (McCormack et al., 2010). This is a test that measures the domain of vocabulary by assessing word recognition and pronunciation (Baker, 2006). The other common measure is the Test of Functional Health Literacy in Adults (TOFHLA). TOFHLA consists of a reading comprehension section to measure prose literacy and a numeracy part that assesses an individual's capability to read and understand hospital documents and labelled prescription vials (Baker, 2006). These methods although useful, are not comprehensive measures of health literacy as they measure or assess selected domains that are thought to be makers of an individual's overall capacity (Baker, 2006; Nutbeam, 2009a).

Other measures do exist and some of these include: the most recently developed Newest Vital Sign (NVS)[7], National Adult Literacy Survey (NALS)[8], Health Activities Literacy Scale

[7] This test consists of a nutrition label for ice cream with six questions about the information contained on the label (Baker, 2006). The NVS assesses math, reading, comprehension skills as well as abstract reasoning (Shah, West, Bremmeyr, & Savoy-Moore, 2010).

(HALS)[9], and the Wide Range Achievement Test-Revised 3 (WRAT-R3)[10]. However, more work needs to be done "*to develop indices that are tailored to defined health content and contexts, and that distinguish between the different levels of knowledge and skills that reflect functional, interactive and critical health literacy*" (Nutbeam, 2009a).

2.2.7 Nutrition and health literacy

Research in health literacy is a growing field, although most health literacy research does not focus on nutrition. Several reviews have linked low health literacy with lifestyle behaviours and health outcomes, although none has focused on the role of health literacy in the context of nutrition behaviours or dietary outcomes (Carbone & Zoellner, 2012).

A systematic review on the available literature on nutrition and health literacy found out that of the 33 studies reviewed, four focused on measurement development, 16 on readability assessments and 13 on individual literacy skills assessments. The systematic review discovered that in some of the nutrition-related health literacy studies, health literacy skills were found to correlate with certain nutrition skills such as estimation of portion seizes (Huizinga et al., 2009), understanding of nutrition labels (Rothman et al., 2006) and seeking of and trust in nutrition information sources (Zoellner et al., 2009). Although there is need for nutrition researchers to use existing health literacy metrics if their work is to be generalizable to the broader field of health literacy (Carbone & Zoellner, 2012).

2.2.8 Nutrition literacy

Nutrition literacy can be defined as the degree to which people have the capacity to obtain, process and understand basic nutrition information (Zoellner et al., 2009). Nutrition literacy can be classified into three levels namely (Pettersen et al., 2009a; Silk et al., 2008):

1. Functional nutrition literacy: basic reading and writing skills necessary to understand and follow simple nutrition messages.

[8] Survey undertaken by the US government in 1992 to determine the range of literacy skills in the US adult population and how many US adults have skills sufficient to function effectively as workers, parents, and citizens (Schwartzberg, VanGeest, & Wang, 2005).

[9] Is a more comprehensive test that differentiates between health-related competencies in five domains (health promotion, health protection, disease prevention, health care and maintenance, and systems navigation and between different health tasks and skills (Baker, 2006; Nutbeam, 2009a).

[10] A nationally standardized achievement test that assesses reading, spelling and arithmetic (Schwartzberg et al., 2005).

2. Interactive nutrition literacy: more advanced literacy which includes the cognitive and interpersonal skills needed to manage nutrition issues in partnership with professionals.
3. Critical nutrition literacy: ability to analyse nutrition information critically, increase awareness, and participate in action to address barriers.

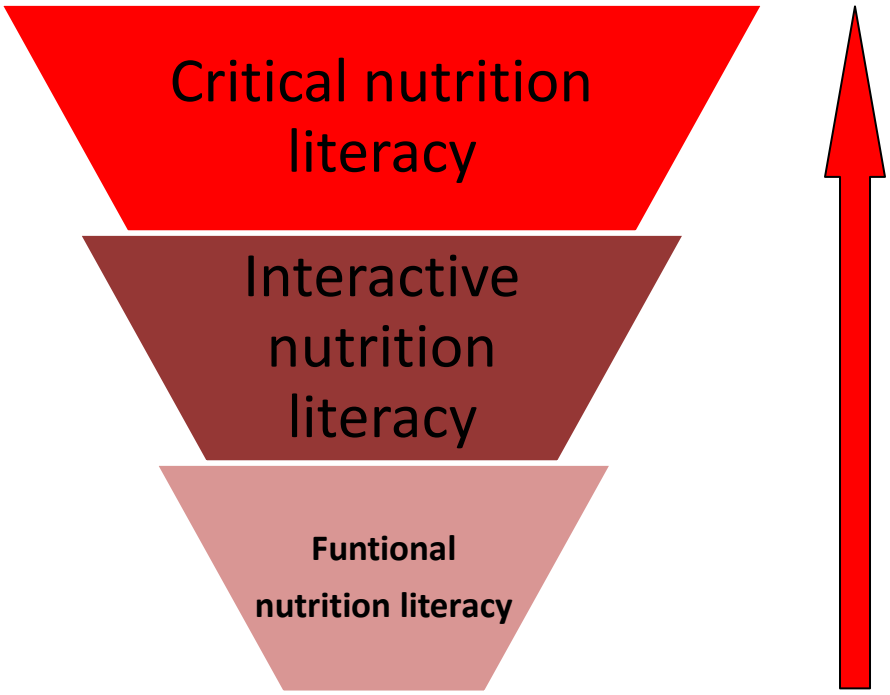

Figure 6. Levels of nutrition literacy (Pettersen et al., 2009a).

As seen from its definition nutrition literacy goes beyond having basic skills of reading, writing to include skills required by an individual to understand and interpret the often complex information about foods and the nutrients they contain. Nowadays, these skills must necessarily include information-processing literacy because nutrition information is now widely and increasingly available from many sources such as the Internet (Laberge, 2011).

Consumers now days have diversity of foods and food products to select from, but in order to make informed decisions concerning which foods to eat, and what quantities are required to maintain a good nutritional status they probably need to have nutrition literacy (Laberge, 2011). Therefore, nutrition literacy is accordingly based on being informed on several issues such as:

Food and health: The human body requires energy and certain essential nutrients (the body cannot make them and therefore must obtain them from food) so as to function adequately. Energy is provided by food that contains macronutrients, required in large amounts (protein, carbohydrate, fats). Food also contains micronutrients such as vitamins and minerals that are required in small amounts and certain amino acids and fatty acids. Food also contains fibre and other components such as phytonutrients that are important for health. Nutrition literacy thus provides an understanding of the basic nutrient groups, their dietary sources and explains their respective roles in maintaining health (Laberge, 2011). The Nutrition literacy status of an individual not only influences how they seek for nutrition information but also to what extent they trust the source of the information (Zoellner et al., 2009). However, no known published research has examined the nutrition literacy of adolescents in Uganda. This could be because the field of nutrition literacy is still in its infancy and primarily limited to a clinical health care setting (Zoellner & Carr, 2009).

2.2.9 A domain based conceptual model of nutrition literacy

Nutrition literacy can be built around four literacy domains: fundamental literacy, scientific literacy, civic literacy and cultural literacy. Skills in either literacy domains could contribute to the development of skills in another domain, thus all four domains would complement one another and also reinforce the development of nutrition literacy (Zarcadoolas, Pleasant, & Greer, 2006).

Figure 7. A literacy domain based conceptual model of nutrition literacy[11] (Zarcadoolas et al., 2006).

2.2.9.1 Fundamental literacy

This refers to one's ability to read, write, speak and work with numbers (Zarcadoolas et al., 2006). Fundamental literacy is a vital component of nutrition literacy because of the following:

- By being able to read, write, speak and compute, individuals are able to acquire and develop skills and live functional lives.
- Both written and spoken nutrition information is made of language (vocabulary and syntax) thus the importance of having fundamental literacy which would enable one to understand and respond to the nutrition information.

2.2.9.2 Scientific literacy

This includes to some extent an understanding of the process of science (Pettersen, 2007). And the basic concepts of science, however it refers to the skills and abilities to understand and use science. This is an important aspect of nutrition literacy as nutrition as a science often comprises of various biochemical processes, and an understanding of some of these concepts can help an individual make sense of nutrition related information (Zarcadoolas et al., 2006).

[11] Model developed by author of thesis.

2.2.9.3 Civil literacy

This refers to the skills and abilities that empower an individual to not only be aware of public issues but also actively participate in critical dialogue and eventually be part of the decision making processes in a given society. Civil literacy includes: knowledge of governmental systems and processes, understanding of the media, knowledge that individual choices can eventually affect other members in the community. An individual with civil literacy can appreciate the need and importance of the development and implementation of various nutrition related guidelines, regulations and policies and be able to critically analyse nutrition information, increase awareness, and participate in the decision making processes (Pettersen et al., 2009a; Silk et al., 2008; Zarcadoolas et al., 2006).

2.2.9.4 Cultural literacy

According to Kreps and Kunimoto (1994), cultural literacy refers to the ability to recognize, understand and use the collective beliefs, customs, worldview and social identity of diverse individuals to interpret and act on information (as cited in Zarcadoolas et al., 2006). Individuals come from different cultures with varying perceptions, beliefs and customs, however cultural literacy can help in the development and communication of nutrition information that is in line with an individual's beliefs, customs, and traditions and thus enable understanding of nutrition messages and make use of cultural practices that can be used to influence the nutrition and health status of individuals. This would for example eventually lead to the nutrition educator understanding and appreciating certain aspects of a patient's culture and the patient also understanding and appreciating important aspects of the scientific and professional culture of the nutrition educator (Zarcadoolas et al., 2006).

2.3 Measurement of nutrition literacy

Research that has been done that relates literacy to the health status of an individual has not included measures of nutrition literacy (Diamond, 2007). However, Diamond (2007) developed a measure of nutritional literacy called the Nutritional Literacy Scale (NLS) in adults that is intended to measure an individual's ability to comprehend nutrition information.

The internal consistency and construct validity of the NLS was assessed by comparing its scores to those of the reading comprehension section of the Short Test of Functional Health

Literacy in Adults (S-TOFHLA) by adult patients from two primary care practices. The NLS score showed acceptable internal consistency of .84 by Cronbach's alpha coefficient (α) and had a Pearson correlation value (*r*) of .61 thus supporting evidence for construct validity (Diamond, 2007).

The NVS literacy assessment tool uses an ice cream nutrition label that is accompanied by six questions. Individuals that score more than four correct responses are unlikely to have low literacy. Those that score less than four correct answers are most likely to have limited literacy. The NVS requires only three minutes to be administered, is reliable (Cronbach's $\alpha = .69$), correlates with the TOFHLA ($r = .49$, $p<.001$) and is available both in English and Spanish (Weiss et al., 2005).

Zoellner et al. (2009), did a cross-sectional study to examine the nutrition literacy status of adults in the lower Mississippi Delta. The study instruments were the NVS and an adapted version of HINTS. Using the NVS categorisation of nutrition literacy, 24% (42) of the respondents had a high likelihood of limited literacy skills (0-1 correct answers), 28% (50) had a possibility of limited literacy skills (2-3 correct answers) and 48% (85) had adequate literacy skills (4-6 correct answers).

Kjøllesdal (2009), performed a study with the aim to develop and test the questionnaire Nutrition Literacy Questionnaire (NLQ), which attempts to measure degrees of nutrition literacy. The NLQ consisted of two main sections; (1) the NLS (Diamond, 2007) and (2) statement items aimed at forming constructs which would reflect the theory of Nutbeam (2000), claiming an existence of three hierarchical levels of health literacy: functional nutrition literacy (*FNL*), interactive nutrition literacy (*INL*) and critical nutrition literacy (*CNL*). Four constructs were developed through the analysis; *FNL, INL, CNLaction* (ability to engage beyond the individual needs e.g. political, community, family, with the goal of others to get a better diet.) and *CNLscientific* (ability to critically assess and evaluate nutrition information from various sources on the basis of scientific criteria). Also several demographic variables were found to contribute significantly to the total variance in the construct variables.

Another study aimed at assessing nursing students nutrition knowledge, level of interactive nutrition literacy and critical nutrition literacy, and their ability to request information from a scientific news brief. The study instrument consisted of a nutrition knowledge test, a scientific news brief, and interactive nutrition literacy and critical nutrition literacy reflecting

statements. The results revealed that the students had a modest level of nutrition knowledge, their ability to request information from the scientific news brief was poor and semi-confirmatory factor analysis revealed three constructs of: *INL, CNLaction* and *CNLscientific* (Dalane, 2011).

Blegen (2011) did a study to determine the nutrition literacy of pupils in year 10 of secondary school in Norway. The questionnaire comprised of 16 questions developed so as to establish constructs based on Nutbeam's theories of health literacy. Analysis of the results led to the development of three constructs: *FNL, INL* and *CNL*.

Aihara and Minai (2011b) did a study to identify the barriers and catalysts of nutrition literacy among elderly Japanese people. Their results revealed that more men had limited nutrition literacy than women. Lower education level and economic status were associated with limited nutrition literacy among women. Informational support and diet/nutrition information obtained from friends was also associated with adequate nutrition literacy among men, although diet/nutrition information from health professionals had a significant relation with adequate nutrition literacy among women.

3. Methodology

This chapter describes the study site, study design, study population, sampling technique, sample size determination, sampling procedure, data collection tools used, data analysis methods and the ethical considerations of the study.

3.1 Study site

The study was conducted in Kampala district[12], in Uganda. The Republic of Uganda according to the 2002 population census had a population of 24.2 million persons. Uganda is located in East Africa and lies astride the equator. It is a landlocked country bordering Kenya in the east, Tanzania in the south, Rwanda in the southwest, the Democratic Republic of Congo in the west, and Southern Sudan in the north. The country has an area of 241,039 square kilometres and is administratively divided into over 100 districts. (Uganda Bureau of Statistics, 2012; Uganda Bureau of Statistics & Macro International Inc, 2007).

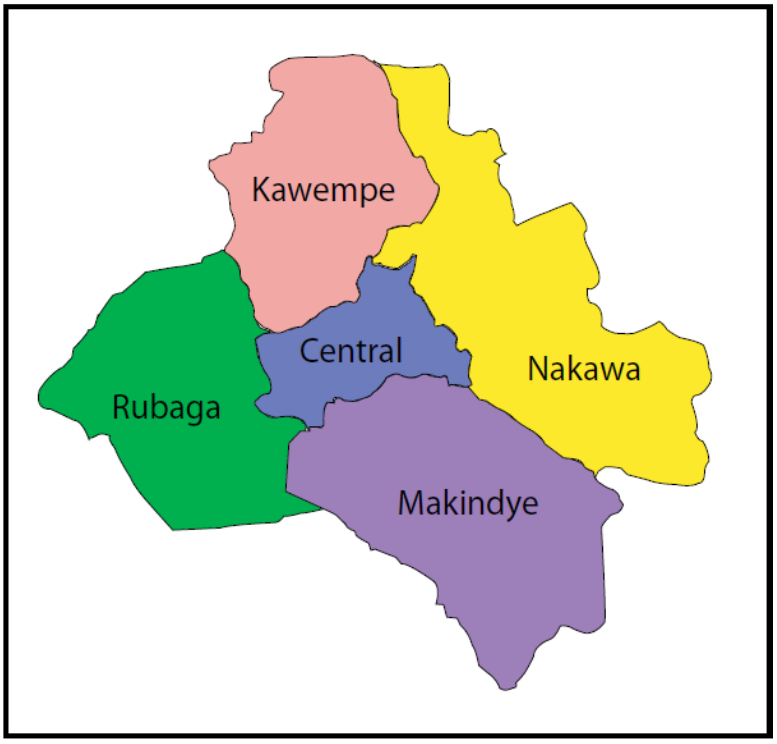

Figure 8. Map showing the five divisions of Kampala district (Rugadya, 2007).

[12] Kampala District is the capital city of Uganda and is divided into five administrative divisions. According to the 2002 population census, Kampala district had a population of approximately 1,189,100 (Wikipedia the free encyclopedia, 2011). See link: http://en.wikipedia.org/wiki/Kampala_District Accessed: 7th March 2011.

3.2 Study design

The study was a descriptive cross-sectional study. A cross-sectional study is an observational study design that involves a single observation. Cross-sectional studies are also at times referred to as prevalence studies and they measure both outcome and exposure status simultaneously (Boslaugh & Watters, 2008; Mosdøl & Brunner, 2005). This study was conducted in Kampala district in Uganda from June 2011- January 2012.

3.3 Study population

The study population was adolescent students aged 13-19 years attending lower secondary school in Kampala district in Uganda. All adolescents in secondary 1 up to secondary 4 (equivalent to *Ungdomsskole*, grades 8-10 in the Norwegian education system) were eligible to take part in this study (Norwegian Ministry of Education and Research, 2007). However, only adolescents in secondary 1 up to secondary 3 were considered as students in secondary 4 were preparing for their final lower secondary examinations at the time of data collection.

3.3.1 Uganda's model of education

Uganda follows a 7-4-2-3 model of education system, with seven years of primary education, four years of lower secondary, two years of upper secondary and three to five years of tertiary education depending on the programme of study. The public higher education sector is composed of universities, national teachers colleges, colleges of commerce, technical colleges, training institutions, and other tertiary institutions. The public universities in Uganda are Makerere University, Kyambogo University both in Kampala district, Mbarara University of Science and Technology in Mbarara district, Gulu University in Gulu district and Busitema University in Busia. There are also other private higher education institutions including over 30 private universities (National Council for Higher Education, 2012; Ngolovoi & Marcucci, 2006).

3.4 Sampling technique

One secondary school was purposively selected from each of the five divisions of Kampala district namely Central, Kawempe, Makindye, Nakawa and Rubaga (see Appendix H). Therefore, the study was conducted in a total of five secondary schools in Kampala district. The

names of the schools were not revealed so as to protect their confidentiality as per the ethical principles that govern research involving human respondents.

Table 1. Selected secondary schools.

Selected school	Division
School 1	Central
School 2	Kawempe
School 3	Makindye
School 4	Nakawa
School 5	Rubaga

The sample size was calculated from the total population of students in the selected schools, which were obtained from the selected schools administration as shown in Table 2.

Table 2. Selected schools population.

Selected school	Population	Source
School 1	2286	School administration (actual)
School 2	2278	School administration (estimate)
School 3	2300	School administration (estimate)
School 4	2100	School administration (estimate)
School 5	2000	School administration (estimate)
Total	10,964	

3.4.1 Sample size determination

The sample size was calculated using the Creative Research System (2011) online sample size calculator[13] at 95% confidence level and a confidence interval of 5. The calculated sample size was 371 respondents. However, an additional 40% (148 respondents) was added to cater for non-response bringing the final sample size to 519 respondents. The sample size was evenly distributed among the five schools with four schools each having a sample of 104 respondents

[13] See link: http://www.surveysystem.com/sscalc.htm Accessed: 7th September 2011.

and one school with 103 respondents. There was a high response rate of 97%, meaning 506 respondents took part in study. All of the results were analysed.

3.4.2 Sampling procedure

An equal number of respondents were then selected from two randomly[14] selected classes[15] of each of the three grades. The frequency of males and females in each of the randomly selected classes was considered when determining the number of males and females to be selected. This was to ensure a representative sample in regard to gender. The determined number of respondents (both males and females) was then asked to volunteer to participate in the study.

3.5 Study instrument

My inspiration to assess the nutrition literacy of adolescent students came from studies by Pettersen et al. (2009a) and that of Zoellner et al. (2009). However, several other studies: (Aarnes, 2009; Blegen, 2011; Dalane, 2011; Diamond, 2007; Kjøllesdal, 2009) also provided me with further insight and understanding of the relatively new concept of nutrition literacy. These studies are discussed in more detail in Chapter 2.

Therefore, I with the guidance of my supervisor[16] developed a self-administered and close-ended questionnaire (see Appendix C) comprising of 29 attitude statements some of which were adapted from (Pettersen et al., 2009a). They were grouped under sub-themes of functional, interactive and critical nutrition literacy. The respondents had to indicate their level of agreement or disagreement by ticking where they felt their answer lies on a Likert scale.

A Likert scale, named after Rensis Likert who invented it, is a type of attitude scale that measures the extent to which an individual agrees or disagrees with a statement or question. It ranges from (1) *strongly disagree*, (2) *disagree*, (3) *neither agree nor disagree*, (4) *agree* to (5) *strongly agree* (Ary, Jacobs, & Sorensen, 2010; Scott & Mazhindu, 2005). However, one of the limitations of using a Likert scale based on five options is that respondents may tend to select the

[14] Random selection of classes was done to ensure that each class had an equal chance of being selected.

[15] Each grade (secondary one, secondary two and secondary three) had four classes, e.g. secondary one red, secondary one blue etc.

[16] Kjell Sverre Pettersen is an associate professor dr. scient. (PhD) at the Faculty of Health Sciences, Department of Health, Nutrition and Management, Oslo and Akershus University College of Applied Sciences, Lillestrøm, Norway. He is also a pioneer in the field of nutrition literacy.

middle option (*neither agree nor disagree*) than struggle to make a decision (Scott & Mazhindu, 2005).

In order to gain more insight into the interactive and critical nutrition literacy of the adolescent students, I also assessed the adolescent students ability to obtain nutrition information and exposure to nutrition information by adapting questions from the Health Information National Trends Survey (HINTS) and from Zoellner et al. (2009) study into my questionnaire. Therefore, the questionnaire also included questions about confidence in seeking nutrition information or advice, barriers to seeking nutrition information and level of trust in various sources of nutrition information.

I decided to use a self-completed questionnaire because they are cheaper, quicker and prevent interviewer bias. The questions were mainly close-ended so as to ensure consistency in the range of responses that were provided by the respondents. However, where necessary open-ended questions were used in order to acquire more detailed information from the respondents (Bruce, Pope, & Stanistreet, 2008). The questionnaire was pilot tested and the necessary changes made before the collection of data. The changes were mainly to correct grammatical and numbering errors.

3.6 Validity and Reliability

3.6.1 Validity

Validity of a scale or questionnaire refers to the extent to which it measures what it is supposed to measure. There is no clear-cut indicator of a scale's validity. However, several types and measures of validity do exist namely: criterion-related validity, content validity, construct validity, face validity, predictive validity, concurrent validity and known-groups technique (Pallant, 2007; Scott & Mazhindu, 2005).

The validity of this study is discussed in more detail Chapter 5, although the various types of validity mentioned above are further explained:

3.6.1.1 Criterion or criterion-related validity

Criterion-related validity is a strong form of validity as it measures the ability to compare quality to another already validated measuring tool or questionnaire (Scott & Mazhindu, 2005).

It can also be defined as whether the tool or instrument is measuring what it claims to be measuring (Field, 2009).

3.6.1.2 Construct validity

Construct validity concerns with testing a scale in terms of theoretically derived hypotheses concerning the nature of the underlying construct (Pallant, 2007). It is the most difficult type of validity to measure as there needs to be clear objective criteria to measure the construct. Factor analysis can be considered as an aspect of construct validity (Fitzpatrick, Davey, Buxton, & Jones, 1998).

3.6.1.3 Face validity

Face validity is also achieved by asking an individual to assess the questions for accuracy and completeness. However, to assess if the content reflects the theme under investigation a panel of experts has to used (Scott & Mazhindu, 2005).

3.6.1.4 Content validity

The content validity (concerns the representativeness of the questions used in the scale) of a questionnaire is a achieved by performing a literature review of the topic before constructing the questionnaire so as to ensure that the questions adequately sample the content that is being investigated (Scott & Mazhindu, 2005).

3.6.1.5 Concurrent validity

This is concerned with how well inferences drawn from a measurement can be used to predict some other behaviour or performance that is measured simultaneously (Boslaugh & Watters, 2008).

3.6.1.6 Predictive validity

This type of validity is similar to concurrent validity, however is refers to the ability to draw inferences about some event in the future, with the data collected at a different time but on the same respondents (Boslaugh & Watters, 2008; Scott & Mazhindu, 2005).

3.6.1.7 Known-groups technique

This involves using two groups that have a shared experience in whom one expects to see a difference which may be reflected in the scores of a given test or results of a performed measurement (Scott & Mazhindu, 2005).

For this study not all the above mentioned types of validity were assessed, however the types assessed included: Face validity, content validity and construct validity. These are discussed further in Chapter 5.

3.6.2 Reliability

Reliability refers to how repeatable measurements are, that is; does an instrument or tool give consistent results across different situations (Boslaugh & Watters, 2008; Field, 2009).

There are 3 major approaches to assessing or measuring reliability:

- Multiple-occasions reliability
- Multiple-forms reliability
- Internal consistency reliability

3.6.2.1 Multiple-occasions reliability

The multiple-occasions reliability is also known as the test-retest reliability and refers to how similarly a test or scale performs over repeated testing's. However, it is not a good measure for volatile qualities such as knowledge or mood state as these can change over time. It can be assessed by computing the correlation coefficient (coefficient of stability) between the scores from each occasion of testing (Boslaugh & Watters, 2008).

3.6.2.2 Multiple-forms reliability

The multiple-forms reliability also called the parallel-forms reliability refers to how similarly different versions of a test, questionnaire or scale perform in measuring the same thing. This type of reliability is important for standardised tests that exist in multiple versions such as the Scholastic Aptitude Test[17] (SAT) (Boslaugh & Watters, 2008).

[17] Test used to measure academic ability among individuals applying to American colleges and universities (Boslaugh & Watters, 2008).

3.6.2.3 Inter consistency reliability

Internal consistency reliability measures how much the items on a test or questionnaire are measuring the same thing. In other words it tries to answer the question: *Do the items that make up the scale or test reflect the same construct?* The assessment of internal consistency reliability depends on the correlation of each item on the scale with each other (inter-item correlation). High inter-item correlations are evidence that the items are measuring the same thing. Internal consistency can be measured in several ways but the commonly used statistic is the Cronbach's Coefficient Alpha (CCA) (Boslaugh & Watters, 2008; Pallant, 2007).

The CCA values range from 0.00 to 1.00 with values of .60 to .70 being deemed the lower limit of acceptability (Hair, Black, Babin, & Anderson, 2006). However, a value of .70 and above is considered an indiction of a high level of internal consistency (Blegen, 2011; Pallant, 2007; Scott & Mazhindu, 2005; Tabachnick & Fidell, 2007).

The approach used in assessing the reliability of this study was by assessing the internal consistency reliability using CCA. Hair et al. (2006) recommendation of CCA values of .60 and above was used to assess the internal consistency of this study. The reliability of this study using this approach is further discussed in Chapter 5.

3.7 Data analysis

Descriptive statistics such as means, standard deviation, skewness and frequencies were determined and summarized. Other statistics performed on the data included: factor analysis, reliability analysis, independent–samples t-test, correlation analysis and linear multiple regression analysis.

All *p*-values were 2-tailed at 95% confidence level and the level of significance was set at $p \leq .05$. For all statistical tests the variables were tested for normal distribution. All the analysis was done using the Statistical Package for Social Sciences (SPSS) 19.0 for Microsoft windows.

3.7.1 Factor analysis

Factor analysis is used in the development and evaluation of tests and scales. It helps to reduce a large number of related variables to a smaller number before they can be used for further analysis such as multiple regression or multivariate analysis of variance (Pallant, 2007).

It is used when the researcher thinks that the responses to many questions are driven by a few underlying structures called 'factors' (Tabachnick & Fidell, 2007). There are two main approaches to factor analysis namely: exploratory and confirmatory factor analysis. Exploratory factor analysis (EFA) is used to explore if there are interrelationships among a set of variables while confirmatory factor analysis is used to confirm specific hypothesis or theories concerning the structure underlying a set of variables (Pallant, 2007).

In this study EFA was performed on the statements and the 'factors' extracted using Principal Components Analysis (PCA) to find out which items (statements) had strong inter-correlations so as to measure the same phenomenon of functional, interactive and critical nutrition literacy.

PCA is a data reduction method that is primarily used to reduce a large data set into a smaller more manageable one. It is based on an orthogonal decomposition of an input matrix to yield an output matrix that consists of a set of orthogonal components or 'factors' that maximise the amount of variation in the variables from the input matrix (Boslaugh & Watters, 2008).

The data was first assessed to find out if it was suitable for factor analysis basing on four major issues namely:

3.7.1.1 Sample size

It is generally recommended that a larger sample size is better for factor analysis (Pallant, 2007). Comrey and Lee (1992) (as cited in Tabachnick & Fidell, 2007) recommend a sample size of 50 as very poor, 100 as poor, 200 as fair, 300 as good and 500 as very good. However, since the sample size of this study was over 500 this means that basing on sample size it was suitable for factor analysis.

3.7.1.2 Missing data

Before EFA, the issue of missing data has to be considered (Fabrigar & Wegener, 2012). According to Tabachnick and Fidell (2007, p. 62), "*Missing data is one of the most pervasive problems in data analysis*". Missing data can have significant effects on the reliability, validity and generalizability of the data (Tabachnick & Fidell, 2001). The seriousness of missing data depends on the pattern of missing data, the amount missing and the reason as to why it is missing. Missing data can be due to equipment malfunction, respondent error or due to mistakes

by the researcher. However, if few data points (<5%) are missing from a large data set in a random pattern, then almost any technique for handling missing data such as pairwise deletion yields similar results (El-Masri & Fox-Wasylyshyn, 2005b; Fox-Wasylyshyn & El-Masri, 2005a; Tabachnick & Fidell, 2007).

3.7.1.3 Strength of the inter-correlations among items

Only those items (statements) that had correlation coefficients greater than .30 were considered for factor analysis.

3.7.1.4 Bartlett's test of sphericity and Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy

The data was analysed to ensure that Bartlett's test of sphericity was significant ($p \leq .05$) and that the KMO index was above the minimum value of .600 (Pallant, 2007; Tabachnick & Fidell, 2007).

3.7.2 Reliability analysis of constructs

After factor analysis, the reliability of the developed constructs was measured by assessing their internal consistency, which is the extent or degree to which the items in the construct are all measuring the same underlying attribute. The internal consistency was measured using the CCA using SPSS. The CCA values range from 0.00 to 1.00 with a value of above .80 indicting a high level of internal consistency (Blegen, 2011; Pallant, 2007; Scott & Mazhindu, 2005; Tabachnick & Fidell, 2007).

3.7.3 Independent–samples t-test

An independent-samples t-test was performed to find out if there were any statistically significant differences between the male and female adolescent students regarding their mean nutrition literacy scores of the developed constructs, barriers to seeking nutrition related information and trust in nutrition information sources.

3.7.4 Correlation analysis

Correlation analysis was also performed on the data to describe the strength and the direction of the linear relationship between the variables (Pallant, 2007). It should however be

noted that correlation statistics measure only association and not causality (Boslaugh & Watters, 2008).

There are two types of correlation namely:

3.7.4.1 Spearman rank order correlation

Spearman rank order correlation (*rho*), which is a non-parametric correlation technique that is used to measure the correlation between ordinal or ranked data and when the data does not meet the criteria for Pearson's correlation (Pallant, 2007).

3.7.4.2 Pearson's product-moment correlation

Pearson's product moment correlation or Pearson product-moment coefficient (*r*) is a parametric correlation technique that is used to measure the correlation between interval level (continuous) variables, although it can also be used to compare a continuous variable and a dichotomous variable such as gender (Pallant, 2007).

Pearson correlation coefficient values range from -1 to +1, the sign in front of the value indicates the direction of the relationship, with a negative sign meaning that as one variable increases, the other decreases and a positive sign meaning that as one variable increases so does the other (Boslaugh & Watters, 2008; Pallant, 2007; Scott & Mazhindu, 2005; Tabachnick & Fidell, 2007). Cohen (1988) (as cited in Pallant, 2007) suggests r = .10 to .29 as a small correlation, r = .30 to .49 as a medium correlation and r = .50 to 1 as a large correlation.

The data meet the criteria for Pearson's correlation; therefore a bivariate Pearson's correlation analysis was performed on the constructs to determine the strength and the direction of the relationship between them, and also to determine which independent variables to use for the multiple regression analysis.

3.7.5 Multiple regression analysis

Multiple regression analysis was done to explore the significant predictors of the variance (R^2) in the developed nutrition literacy constructs as dependent variables. This method examines the relationship among several variables. It examines the relationship between one continuous dependent variable (DV) and other continuous independent variables (IV). It is therefore used in analysis to find prediction of the DV from one or more IVs. Regression analysis can be used to

predict an outcome variable from one predictor variable (simple regression) or from several predictor variables (multiple regression) (Field, 2009).

A regression analysis yields the coefficient of multiple correlation (R) and the coefficient of determination (R^2).

3.7.5.1 Coefficient of multiple correlation (*R*)

This shows the relationship between the predictor variables in combination and the DV. And when R is squared it yields the coefficient of determination (R^2) (Field, 2009; Pallant, 2007).

3.7.5.2 Coefficient of determination (R^2)

R^2 ranges from 0.00 to 1.00 and is a measure of the proportion of the total variance of the dependent variable about its mean that is explained by the independent or predictor variables (Hair et al., 2006). R^2 explains the amount of variability in the DV that is due to differences in scores on the predictor variables or IVs (Ary et al., 2010; Boslaugh & Watters, 2008; Field, 2009; Pallant, 2007; Scott & Mazhindu, 2005; Tabachnick & Fidell, 2007). For example if the R^2 value is .07, this means that only 7 % of a total variance of 100% could be 'explained' by the independent or predictor variables.

3.7.5.3 Standardized beta coefficient (β)

The beta standardized coefficient values (β) were also assessed, these coefficients allow for a direct comparison of the relative effect of each independent variable on the dependent variable (Hair et al., 2006).

The standardized beta coefficient values are an indication of the number of standard deviations that the outcome will change as a result of one standard deviation in the predictor. They are all measured in standard deviations units therefore they are directly comparable and provide a better insight into how important a predictor variable is in a given regression model (Field, 2009). The higher the value the more influence the independent variable has on the dependent variable (Pallant, 2007). *p-values* were assessed to determine if the independent variables made a statistically significant contribution to the prediction of the dependent variable (Pallant, 2007).

3.8 Ethical considerations

Approval and permission to carry out the study was obtained from the relevant authorities before the pre-testing, standardisation of the study instruments and the actual collection of data. Clearance and approval was sought from the Norwegian Social Science Data Services (see Appendix D), the Uganda National Council for Science and Technology (UNCST)[18] (see Appendix E), Ministry of Education & Sports[19] (see Appendix F) and Office of the President of the Republic of Uganda (see Appendix G).

At secondary school level, permission was sought from the head teachers of the selected schools through the Ministry of Education & Sports. Written informed consent was requested from the actual respondents only after having been fully informed what the study was about, the objectives of the study, and that the study was solely for academic purposes and that participation was voluntary. All measures were undertaken to ensure the confidentiality and anonymity of the respondents and schools that participated in the study.

3.9 Institutional collaborations

The study involved collaborations among the Faculty of Health, Nutrition and Management at Oslo and Akershus University College of Applied Sciences, Lillestrøm, Norway. The department of Human Nutrition and Home Economics of Kyambogo University, Kampala, Uganda, and the Ministry of Education & Sports, Kampala, Uganda.

[18] The UNCST was established in 1990 by Act of Parliament (CAP 209 of the Laws of Uganda) as a semi-autonomous government agency mandated to advise, develop, implement policies and strategies for integrating Science, Technology and Research development in Uganda. The UNCST also ensures that research activities in Uganda are carried out in a safe and ethical manner, and that the results of research guide public policy formulation (Uganda National Council for Science and Technology, 2011).
See link http://www.uncst.go.ug/ . Accessed on: 16th February 2011.

[19] MOE is mandated to provide guidance support, coordinate, regulate and promote quality education and sports to all persons in Uganda (Ministry of Education and Sports for the Republic of Uganda, 2011).
See link: http://www.education.go.ug/home/about-the-ministry.html. Accessed: 16th February 2011.

4. Results

4.1 Introduction

This chapter presents the findings of the study which are presented in form of tables and figures where necessary. The results are based on the overall aim, sub-aims and cohort research questions of the study. In the first part of this chapter the demographics (gender distribution and average age) of the respondents are presented. Then the research questions reflecting the study aim are answered in chronological order.

4.2 Demographics

All the five secondary schools that were purposively selected accepted to participate in the study. Data was collected from a total number of 519 adolescent students using self-administered questionnaires with a response rate of 97% thus 506 adolescent students accepted to participate in the study (see Table 3). The collected data was analysed using both descriptive and inferential statistics with the data being analysed using computer programme SPSS version 19.0 for windows.

Table 3. Respondents' demographics.

Gender	**(*n*)**	**(%)**	**Age**
			***M* ± *SD*[h]**
Males	248	49	15 ± 1
Females	258	51	15 ± 1
Total (*N*)	506	100	

Note. [h]Mean ± Standard Deviation.

The total number of respondents was 506. The respondents were almost evenly distributed in regards to gender with half of the respondents being female and the other half male. Both genders had an average age of approximately 15 years. The number of respondents and their average age according to class are shown in Table 4.

Table 4. Class demographics.

Class	**Secondary one**		**Secondary two**		**Secondary three**	
Gender	Males (80)*	Females (83)	Males (86)	Females (71)	Males (81)	Females (104)
Age	14 ± 1[h]	13 ± 1	15 ± 1	14 ± 1	16 ± 1	16 ± 1

Note. * (*n*). [h]Mean ± Standard Deviation.

The average age of the respondents was approximately the same for each class for both the male and female students.

4.3 Development of the nutrition literacy constructs

EFA was used to explore if the attitude statements in the study instrument reflected the three levels of nutrition literacy as based on Nutbeam's hierarchical model of health literacy (Nutbeam, 2000; Pettersen et al., 2009a).

The factor analysis was run using an orthogonal rotation (varimax) and factors extracted using PCA. After the EFA, the reliability of the developed constructs was measured by assessing their internal consistency by measuring their CCA. Missing data analysis of the developed nutrition literacy constructs was not performed as non of the developed nutrition literacy constructs had missing data that was more than 5% of the total sample size (Tabachnick & Fidell, 2001, 2007).

4.3.1 *FNL* construct development

Functional nutrition literacy is having the basic reading and writing skills necessary to understand and follow simple nutrition messages (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008). However, in my study I define the *FNL* construct as the extent to which an individual experiences difficulty in understanding and comprehending nutrition messages.

The *FNL* construct comprised of nine attitude statements that were scored using a Likert scale. The lowest score was one and the highest score five. The data was suitable for factor analysis as KMO was .662 which was above recommended value of .600 (Pallant, 2007). The Barlett's test of Sphericity value χ^2 (36) = 316.185, p = .000) was significant (Field, 2009; Pallant, 2007).

After EFA two attitude statements (4.7 & 4.9) were eliminated as they had a factor loading of less than 0.300. The reliability of the *FNL* construct was measured by assessing its internal consistency using the CCA. The CCA value was .56 a value below the minimum recommended value of .60 (Hair et al., 2006).

Table 5. Summary of the exploratory factor analysis for the functional nutrition literacy construct *FNL* (*N*= 506).

Statements	Factor 1
	Factor loading
4.2. I find it difficult to understand the jargon (words) used by nutrition, health and food experts (scale reversed).	0.665
4.1. I find the language used by nutrition, health and food experts difficult to understand (scale reversed).	0.648
4.3. When I read information about nutrition, diet I find it difficult to understand (scale reversed).	0.638
4.5. When I read information about nutrition, food or diet I need someone to help me understand it (scale reversed).	0.499
4.8. When I read an article about nutrition, food or diet I find words that I don't know (scale reversed).	0.481
4.6. I am not familiar with World Health Organization (WHO) recommendation for daily intake of fruits and vegetables (scale reversed).	0.333
4.4. I find it difficult to know how I should change my diet when I get dietary advice from the doctor, nurse or the like (scale reversed).	0.332
4.7. I am familiar with the food pyramid.	<0.300*
4.9. I am familiar with the concept of a 'balanced diet'.	<0.300*

Note. * Not included in the reliability analysis.

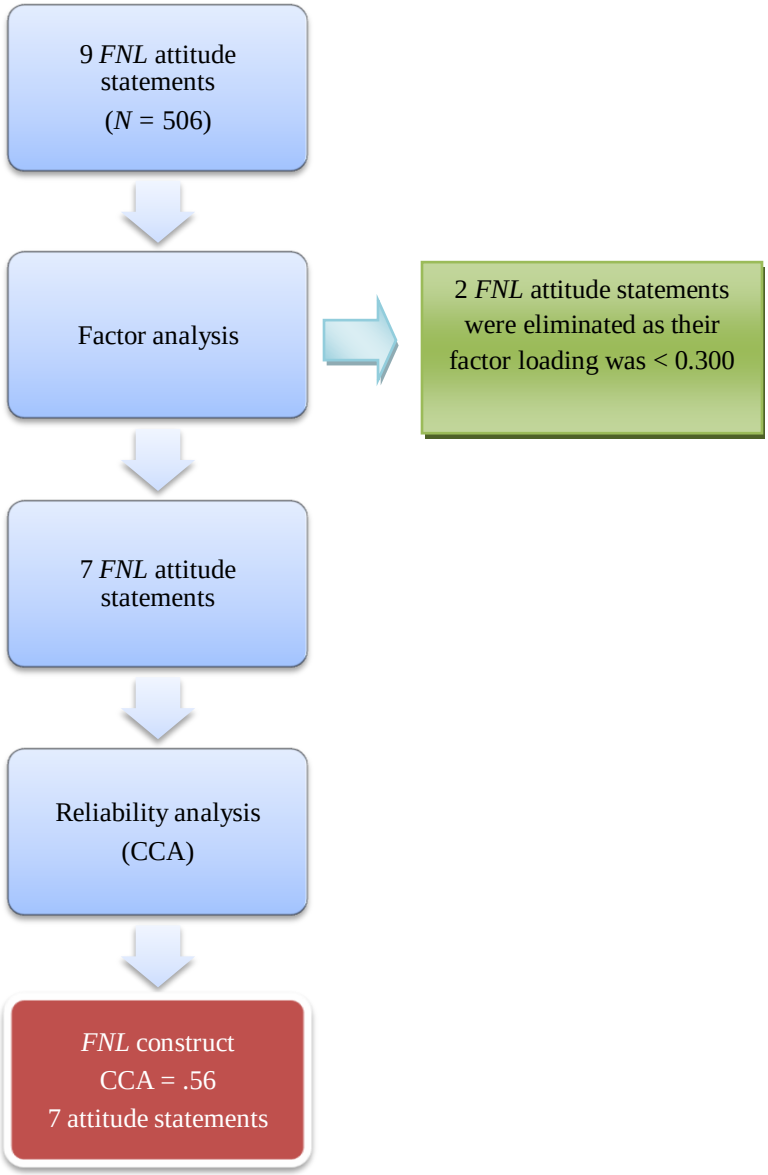

Figure 9. Model showing the development of the *FNL* construct.

4.3.2 *INL* construct development

Interactive nutrition literacy is more advanced literacy which includes the cognitive and interpersonal skills needed to manage nutrition issues in partnership with professionals (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008).

The *INL* construct comprised of nine attitude statements that were scored using the Likert scale. The lowest score was one and the highest score five. The data was suitable for factor

analysis as KMO was .743 which was above recommended value of .600 (Pallant, 2007). The Barlett's test of Sphericity value χ^2 (36) = 396.443, p = .000) was significant (Field, 2009; Pallant, 2007).

Table 6. Summary of the exploratory factor analysis for the interactive nutrition literacy constructs *INL* and *INL**discuss*** (*N*= 499).

Statements	Factor 1	Factor 2	Factor 3
	Factor loading	**Factor loading**	**Factor loading**
5.1. I have gathered information about diet from various sources that I think is relevant for me.	0.698		
5.2. I use the internet when I am looking for information about nutrition such as diet.	0.681		
5.7. I readily take the initiative to discuss with dietary experts (for example a doctor, nurse or the like) about healthy eating.	0.599		
5.4. I have changed my eating habits based on the information about diet that I have gathered.	0.557		
5.9. I have discussed my thoughts about diet to someone else (for example my friends, family, relatives, a doctor, nurse or the like).		0.844^{+}	
5.3. I discuss about diet with my friends, family and relatives.		0.685^{+}	
5.6. I often read material about what constitutes a balanced diet.		0.435	0.315
5.5. I don't follow public debate about diet for example on television, radio (scale reversed).			0.787
5.8. When I want information about diet I do not know which departments within the health service that I can go to for help (scale reversed).			0.633

Note. $^{+}$ Were used to develop the *INL**discuss*** construct.

Two attitude statements (5.5 & 5.8) were eliminated as item-total statistics by SPSS showed that by eliminating them the CCA would increase. The reliability of the *FNL* construct was measured by assessing its internal consistency using the CCA. The CCA value was .63 a value above the recommended .60 value (Hair et al., 2006).

4.3.3 *INLdiscuss* construct development

*INL**discuss*** can be described as the willingness to discuss nutrition-related issues with other individuals such as family, friends and professionals (nutritionists, dieticians) (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008).

Two attitude statements (5.3 & 5.9) that had high factor loadings (Factor 2) and thus seemed to be measuring the same underlying construct were used to develop the *INL**discuss*** construct. The reliability of the *INL**discuss*** construct was measured by assessing its internal consistency using the CCA. The CCA value was .51.

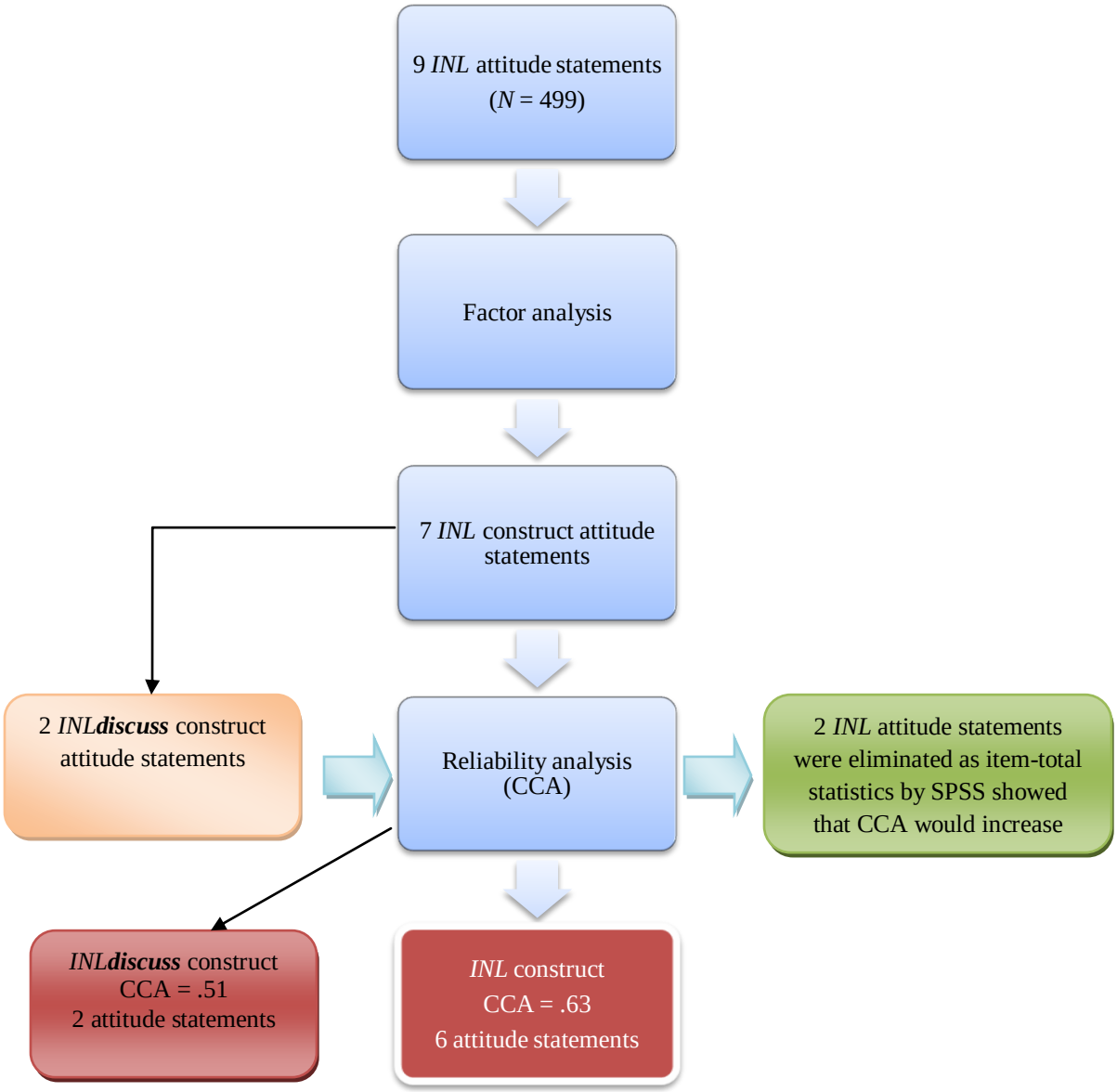

Figure 10. Model showing the development of the *INL* and *INL**discuss*** constructs.

4.3.4 *CNLaction* construct development

Critical nutrition literacy reflects the ability to analyze nutrition information critically, increase awareness, and participate in actions to address barriers (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008). *CNL**action*** can be defined as an individual's willingness to take action to improve nutritional aspects ranging from a personal level, national and international level (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008).

The *CNL**action*** construct comprised of 11 attitude statements. The data was suitable for factor analysis as KMO was .746 which was above recommended value of .600 (Pallant, 2007). The Barlett's test of Sphericity value χ^2 (55) = 622.194, p = .000) was significant (Field, 2009; Pallant, 2007).

After EFA all attitude statements had a factor loading of 0.300 or more (see Table 7). Statements (6.1, 6.2, 6.3, 6.4, 6.5 & 6.11) were used to develop the *CNL**action*** construct. The reliability of the *CNL**action*** construct was measured by assessing its internal consistency using the CCA. The CCA value was .62. Statement (6.10) was eliminated as item-total statistics by SPSS showed that by eliminating it the CCA would increase.

4.3.5 *CNLmedia* construct development

*CNL**media*** reflects the ability of an individual to evaluate nutritional claims made by media basing on sound scientific principles (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008).

As shown in Table 7, statements (6.8 & 6.9) were used to develop the *CNL**media*** construct. The reliability of the *CNL**media*** construct was measured by assessing its internal consistency using the CCA. The CCA value was .46.

4.3.6 *CNLinfluence* construct development

*CNL**influence*** reflects the extent to which an individual's dietary habits can be influenced by other individuals and media (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008). Statements (6.6 & 6.7) were used to develop the *CNL**influence*** construct. The reliability of the *CNL**influence*** construct was measured by assessing its internal consistency using the CCA. The CCA value was .60.

Table 7. Summary of the exploratory factor analysis for the critical nutrition literacy constructs *CNL**action**, CNL**influence*** and *CNL**media*** (*N*= 506).

Statements	Factor 1	Factor 2	Factor 3
	Factor loading	**Factor loading**	**Factor loading**
6.2. I am willing to take an active role in measures aimed at promoting a healthier diet at my school.	0.764		
6.3. I expect my school to serve healthy food.	0.642		
6.1. I would readily get involved in political issues targeted at improving people's diet in Uganda.	0.582		
6.4. I try to influence others (for example my family and friends) to eat healthy food.	0.542		
6.5. It is important for me that the school canteens have a good selection of healthy food.	0.515		
6.9. I believe that the media's presentation of scientific findings about nutrition, diet, food is correct (scale reversed).		0.777$^{\uparrow}$	
6.8. I trust the various diets that I read in newspapers, magazines, etc (scale reversed).		0.684$^{\uparrow}$	
6.11. When I read information about nutrition, diet or food it is important to me that it is based on scientific evidence.	0.338		
6.7. I tend to be influenced by the dietary advice I get from my family, friends (scale reversed).			0.737^{+}
6.6. I tend to be influenced by the dietary advice I read in newspapers, magazines etc (scale reversed).			0.690^{+}
6.10. I find it difficult to distinguish scientific information from non-scientific information about diet (scale reversed).			-0.453*

Note. * Was not included in the *CNL**action*** construct development. $^{\uparrow}$Used in the development of the *CNL**media*** construct. $^{+}$ Used in the development of *CNL**influence*** construct.

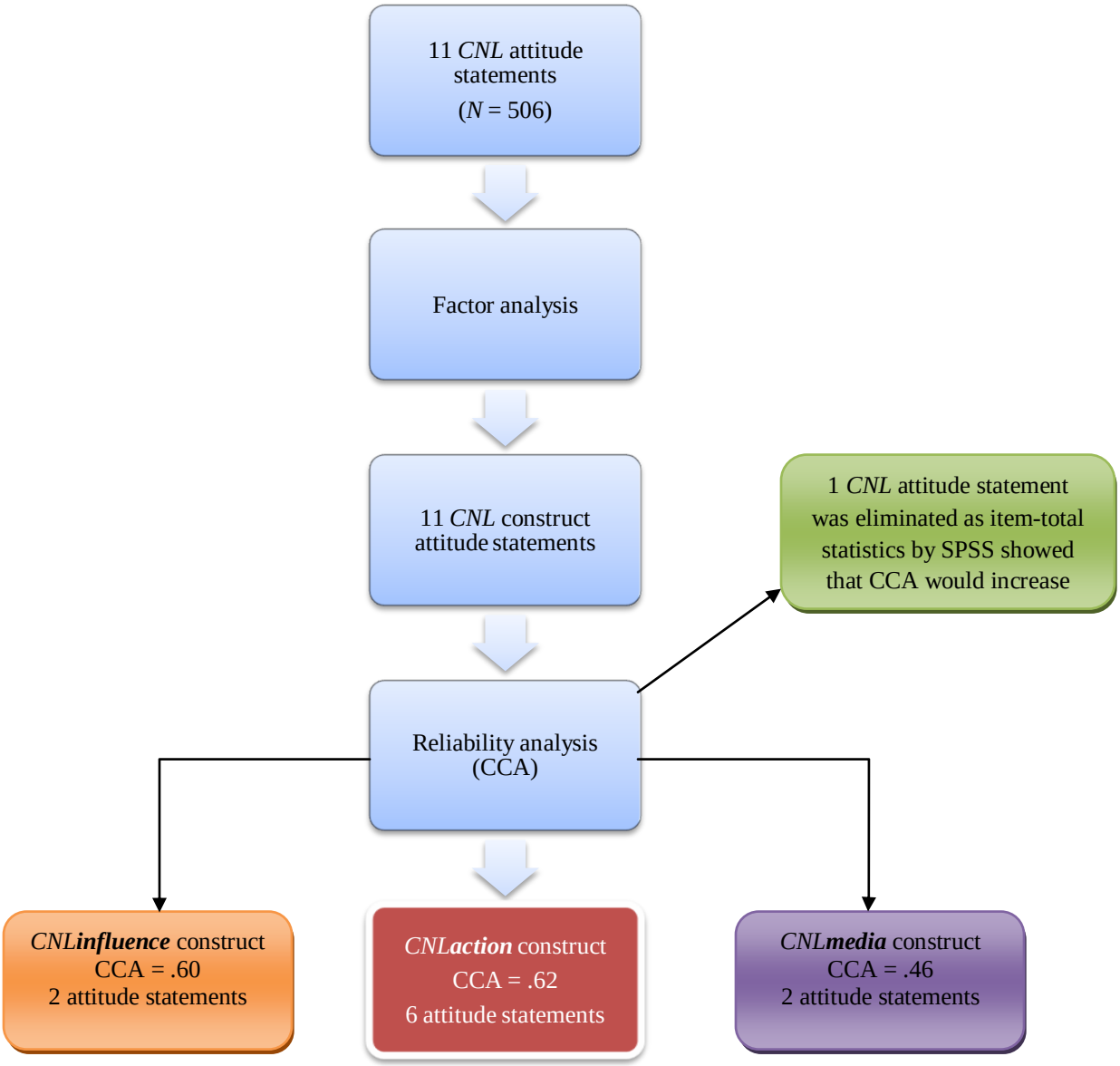

Figure 11. Model showing the development of the *CNL**action***, *CNL**media*** and *CNL**influence*** constructs.

4.3.7 *GrandNL* construct development

The grand nutrition literacy construct (*GrandNL*) describes as an individual's overall nutrition literacy. It is the totality of functional, interactive and critical nutrition literacy (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008). The *GrandNL* construct comprised of 24 attitude statements. The data was suitable for factor analysis as KMO was .762 which was above recommended value of .600 (Pallant, 2007). The Barlett's test of Sphericity value χ^2 (276) = 1699.000, p = .000) was significant (Field, 2009; Pallant, 2007).

All the attitude statements of the rest of developed nutrition literacy constructs that had a factor loading of 0.300 or more were used to develop the *GrandNL* construct. The reliability of the *GrandNL* construct was measured by assessing its internal consistency using the CCA. The CCA value was .54.

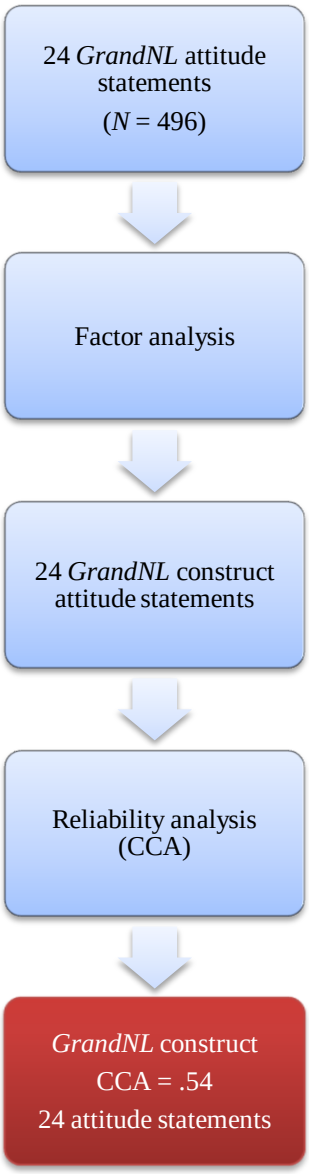

Figure 12. Model showing the development of the *GrandNL* construct.

4.4 Level of functional, interactive and critical nutrition literacy among the adolescent students

Table 8. Items, sample size, mean, standard deviation, skewness and Cronbach's alpha of the constructs.

Construct	No. of items	Items	*N*	*M* ± *SD*	Skewness	α
FNL[a]	7	4.1, 4.2, 4.3 4.4, 4.5, 4.6, 4.8*	506	3.07 ± 0.67	0.21	.56
INL[b]	6	5.1, 5.2 5.3, 5.4 5.6, 5.7	499	3.16 ± 0.76	0.06	.63
*INL**discuss***[c]	2	5.3,5.9	500	3.64 ± 0.97	-0.63	.51
*CNL**action***[d]	6	6.1,6.2 6.3,6.4 6.5,6.11	498	3.97 ± 0.63	-0.78	.62
*CNL**media***[e]	2	6.9, 6.8*	499	2.48 ± 0.91	0.33	.46
*CNL**influence***[f]	2	6.6, 6.7*	499	2.57 ± 1.02	0.42	.60
GrandNL[g]	24	Items of all constructs	496	3.15 ± 0.34	-0.01	.54

Note. [a]Measures the extent to which an individual experiences difficulty in understanding and comprehending nutrition messages.
[b] Measures the interpersonal skills needed to manage nutrition issues in collaboration with other individuals.
[c] Measures an individual's willingness to discuss nutrition issues with other individuals.
[d]Measures an individual's willingness to take action to improve nutritional aspects ranging from a personal level, national and international level.
[e] Measures individual's ability to evaluate nutritional claims made by media basing on sound scientific principles.
[f] Measures the extent to which an individual's dietary habits can be influenced by other individuals and media.
[g] Measures an individual's overall nutrition literacy.
*All scales reversed.

A total of seven nutrition literacy constructs were developed from the collected data after performing EFA[20].

[20] Is a statistical method applied to a single set of variables when one is interested in finding out which variables in the set form coherent subsets that are relatively independent of one another. The variables that correlate with one another but largely independent of other subsets of variables are combined into factors (Tabachnick & Fidell, 2007).

The nutrition literacy construct with the highest CCA[21] value was the *INL* construct. However, the *CNL**action*** construct had the highest mean score while the *CNL**media*** construct had the lowest CCA value and mean score, as shown in Table 8.

Only three of the seven developed nutrition literacy constructs had CCA values above the recommended minimum level of .60 (Hair et al., 2006). A possible explanation for the low values is that CCA values are dependent on the number of items in the scale. And since the scales consisted of few items this resulted in lower values (Pallant, 2007).

Table 9. Mean, standard deviation, skewness and sample size of the items of the *FNL* construct.

FNL	***M* ± *SD***	**Skewness**	***N***
4.1. I find the language used by nutrition, health and food experts difficult to understand (scale reversed).	3.34 ± 1.25	-0.20	506
4.2. I find it difficult to understand the jargon (words) used by nutrition, health and food experts (scale reversed).	3.06 ± 1.29	0.85	506
4.3. When I read information about nutrition, food or diet I find it difficult to understand (scale reversed).	3.71 ± 1.15	-0.78	506
4.4. I find it difficult to know how I should change my diet when I get dietary advice from the doctor, nurse or the like (scale reversed).	3.25 ± 1.35	-0.16	506
4.5. When I read information about nutrition, food or diet I need someone to help me understand it (scale reversed).	2.79 ± 1.32	0.31	506
4.6. I am not familiar with World Health Organisation (WHO) recommendation for daily intake of fruits and vegetables (scale reversed).	2.89 ± 1.41	0.18	506
4.8. When I read an article about nutrition, food or diet I find words that I don't know (scale reversed).	2.48 ± 1.21	0.73	506

[21] This statistic measures the reliability of a scale (how free a scale is from random error) by assessing its internal consistency (the degree to which the items that make up a scale are all measuring the same underlying attribute), it thus provides an indication of the average correlation among all the items that make up a given scale. The values are between 0-1 with higher values showing greater reliability (Pallant, 2007).

The highest score was that of item 4.3 (*When I read information about nutrition, food or diet I find it difficult to understand*), the lowest score was that of item 4.8 (*When I read an article about nutrition, food or diet I find words that I don't know*).

Table 10. Mean, standard deviation, skewness and sample size of the items of the *INL* construct.

INL	***M* ± *SD***	**Skewness**	***N***
5.1. I have gathered information about diet from various sources that I think is relevant for me.	3.08 ± 1.28	-0.74	505
5.2. I use the internet when I am looking for information about nutrition such as diet.	2.64 ± 1.35	0.48	505
5. 3. I discuss about diet with my friends, family and relatives.	3.64 ± 1.18	-0.81	505
5.4. I have changed my eating habits based on the information about diet that I have gathered.	3.53 ± 1.26	-0.69	505
5.6. I often read material about what constitutes a balanced diet.	3.25 ± 1.26	-0.22	500
5.7. I readily take the initiative to discuss with dietary experts (for example a doctor, nurse or the like) about healthy eating.	2.76 ± 1.31	0.31	500

The highest score was that of item 5.3 (*I discuss about diet with my friends, family and relatives*). The lowest score was that of item 5.2 (*I use the internet when I am looking for information about nutrition such as diet*).

Table 11. Mean, standard deviation, skewness and sample size of the items of the *INL**discuss*** construct.

*INL**discuss***	***M* ± *SD***	**Skewness**	***N***
5. 3. I discuss about diet with my friends, family and relatives.	3.64 ± 1.18	-0.81	505
5.9. I have discussed my thoughts about diet to someone else (for example my friends, family, relatives, a doctor, nurse or the like).	3.64 ± 1.18	-0.76	500

All the scores of the items *INL**discuss*** were above the middle value (3) on the Likert scale, and had the same highest score.

Table 12. Mean, standard deviation, skewness and sample size of the items of the *CNL**action*** construct.

*CNL**action***	***M* ± *SD***	**Skewness**	***N***
6.1. I would readily get involved in political issues targeted at improving people's diet in Uganda.	3.48 ± 1.36	-0.51	499
6.2. I am willing to take an active role in measures aimed at promoting a healthier diet at my school.	4.00 ± 1.01	-1.30	499
6.3. I expect my school to serve healthy food.	4.36 ± 0.81	-1.89	499
6.4. I try to influence others (for example my family and friends) to eat healthy food.	4.07 ± 0.94	-1.30	499
6.5. It is important for me that the school canteens have a good selection of healthy food.	3.98 ± 1.11	-1.15	499
6.11. When I read information about nutrition, diet or food it is important to me that it is based on scientific evidence.	3.96 ± 1.12	-1.10	499

All the scores of the *CNL**action*** items were above the middle value (3) on the Likert scale. The highest score was that of item 6.3 (*I expect my school to serve healthy food*). And the

lowest score was that of item 6.1. (*I would readily get involved in political issues targeted at improving people's diet in Uganda*).

Table 13. Mean, standard deviation, skewness and sample size of the items of the *CNL**media*** construct.

*CNL**media***	***M* ± *SD***	**Skewness**	***N***
6.8. I trust the various diets that I read in newspapers, magazines, etc (scale reversed).	2.67 ± 1.18	0.38	499
6.9. I believe that the media's presentation of scientific findings about nutrition, diet, food is correct (scale reversed).	2.29 ± 1.07	0.64	499

All items of the *CNL**media*** construct had low scores that were below the middle value (3) on the Likert scale as shown in Table 13.

Table 14. Mean, standard deviation, skewness and sample size of the items of the *CNL**influence*** construct.

*CNL**influence***	***M* ± *SD***	**Skewness**	***N***
6.6. I tend to be influenced by the dietary advice I read in newspapers, magazines etc (scale reversed).	2.61 ± 1.21	0.42	499
6.7. I tend to be influenced by the dietary advice I get from my family, friends (scale reversed).	2.53 ± 1.20	0.51	499

All items of the *CNL**influence*** construct had low scores as shown in Table 14, the scores were below the middle value (3) on the Likert scale.

4.5 Mean nutrition literacy scores between the genders

Table 15. Independent-samples t-test results.

Construct	Males		Females		*p-value*
	M* ± *SD	***n***	***M* ± *SD***	***n***	
FNL	3.09 ± 0.69	248	3.06 ± 0.66	258	.583
INL	3.14 ± 0.71	245	3.17 ± 0.80	254	.755
*INL**discuss***	3.55 ± 0.98	246	3.72 ± 0.95	254	.045*
*CNL**action***	3.09 ± 0.61	246	4.04 ± 0.64	252	.010*
*CNL**media***	2.48 ± 0.90	246	2.48 ± 0.92	253	.995
*CNL**influence***	2.55 ± 1.01	246	2.59 ± 1.03	253	.629
GrandNL	3.12 ± 0.34	244	3.18 ± 0.35	252	.066

Note. *significant difference ($p \leq .05$).

There was a significant difference in mean nutrition literacy scores of the *INL**discuss*** and *CNL**action*** constructs between the male and female adolescent students with the females having the higher score in both constructs.

4.6 Correlation between the nutrition literacy constructs

Table 16. Bivariate correlations between the nutrition literacy constructs.

Construct	*GrandNL*	*CNL**influence***	*CNL**media***	*CNL**action***	*INL**discuss***	*INL*
FNL	.34**	-.15**	-.09*	.01	.09	.22**
INL	.56**	-.37**	-.10*	.33**	.53**	
*INL**discuss***	.67**	-.19**	-.05	.32**		
*CNL**action***	.30**	-.36**	-.23**			
*CNL**media***	.40**	.23**				
*CNL**influence***	.22**					

Note. **significant at 0.01(2-tailed), *significant at 0.05(2-tailed)

All the constructs were significantly positively correlated to the grand nutrition literacy construct (*GrandNL*), with the *INL**discuss*** construct having the highest correlation value of .67.

*CNL**influence*** was significantly negatively correlated with all the other constructs, expect with *CNL**media*** with which it was positively correlated.

The *CNL**media*** construct was significantly negatively correlated with the *FNL, INL,* and *CNL**action*** constructs.

The CNL***action*** construct was positively correlated to the *GrandNL, INL* and *INL**discuss*** constructs, however it was negatively correlated to the *CNL**influence*** and *CNL**media*** constructs.

The *INL**discuss*** was significantly positively correlated to the *GrandNL, INL, CNL**action***, although significantly negatively correlated to the CNL***influence*** construct.

The *INL* construct was significantly positively correlated to the *GrandNL, FNL, INL**discuss***, and *CNL**action***. However, it was negatively correlated to the *CNL**influence*** and *CNL**media*** constructs.

The *FNL* construct was significantly positively correlated to the *GrandNL* and *INL* constructs but negatively correlated to the *CNL**influence*** and *CNL**media*** constructs.

4.6.1 Correlation between the independent variables and nutrition literacy constructs

Table 17. Correlation matrix of independent variables and nutrition literacy constructs.

Variable	Construct						
	FNL	*INL*	*INL**discuss***	*CNL**action***	*CNL**media***	*CNL**influence***	*GrandNL*
Age	-.08	-.05	-.04	-.02	-.02	-.02	-.09
Class	-.03	.02	.05	.06	.03	-.05	.02
Gender	-.02	.01	.90*	.12*	.00	.02	.08
Trust in a doctor, nurse or any other health personnel	.07	.07	.10*	.23**	-.18**	-.05	.06
Trust in a nutritionist or dietician	-.01	.04	-.01	.19**	-.15**	-.12*	-.06
Trust in family	.06	.23**	.12**	.05	.00	-.19**	.09*
Trust in friends	.05	.25**	.12**	.09	-.09	-.22**	.05
Trust in textbooks	.00	.08	.06	.17**	-.20**	-.08	-.02
Trust in newspapers or magazines	.10*	.14**	-.02	.05	-.22**	-.10*	-.05
Trust in the internet	.03	.05	.05	.05	-.10*	.08	.06
Trust in television	.07	.04	.01	.09	-.15**	-.06	-.02
Trust in radio	.06	.08	.03	.09	-.16**	.00	.01
Trust in government health agencies	.04	.19**	.03	.14**	-.07	-.21**	.01
Trust in international organizations such as WHO	-.06	.09	.21**	.21**	-.06	-.06	.12*

Note. **significant at 0.01(2-tailed). *significant at 0.05(2-tailed)

4.7 Predictors of variance in the nutrition literacy constructs among the adolescent students

Table 18. Linear multiple regression model using the nutrition literacy constructs as the dependent variables and gender and trust in nutrition information sources as the independent variables.

Variable	Construct						
	FNL	*INL*	*INL**discuss***	*CNL**action***	*CNL**media***	*CNL**influence***	*GrandNL*
N	461	457	457	459	458	458	455
Trust in a doctor, nurse or any other health personnel							
β	-	-	-	0.244	-	-	-
p-value				.000*			
Trust in international organizations such as WHO				-	-	-	
β	-	-	0.210				0.120
p-value			.000*				.010*
Trust in Friends							
β	-	0.165	-	-	-	-0.160	-
p-value		.001*				.001*	
Gender							
β	-		-	0.155	-	-	-
p-value				.001*			
Trust in Family							
β	-	0.143	-	-	-	-0.111	-
p-value		.003*				.023*	
Trust in government health agencies	-		-	-	-		-
β		0.136				-0.139	
p-value		.003*				.004*	
Trust in a nutritionist or dietician	-	-	-	-	-		-
β						-0.110	
p-value						.018*	
Trust in newspapers or magazines		-	-	-		-	-
β	0.095				-0.218		
p-value	.042*				.000*		
R^2 (%)	1	10	4	8	5	10	1

Note. R^2 = Coefficient of determination. β = Standardized beta coefficient. *significant ($p \leq .05$)

4.7.1 Prediction of variance in the *FNL* construct

Only one independent variable correlated significantly with the dependent variable *FNL* (see Table 17). It was added in a linear multiple regression model, and it showed significant contribution to the explained variance[22] in the *FNL* construct. Therefore, trust in newspapers or magazines as sources of nutrition information contributes to only 1% of the variance in the *FNL* construct.

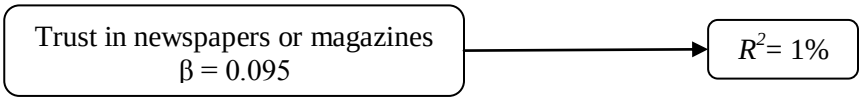

Figure 13. Variables that had a significant contribution to the variance of the *FNL* construct.

4.7.2 Prediction of variance in the *INL* construct

All the four independent variables (see Table 17) that correlated significantly with the dependent variable *INL* were added in a linear multiple regression model. Three of the variables showed significant contribution to the explained variance in the *INL* construct. The three variables (trust in friends, trust in family and trust in government health agencies as sources of nutrition information) contributed to 10% of the variance in the *INL* construct (see Table 18).

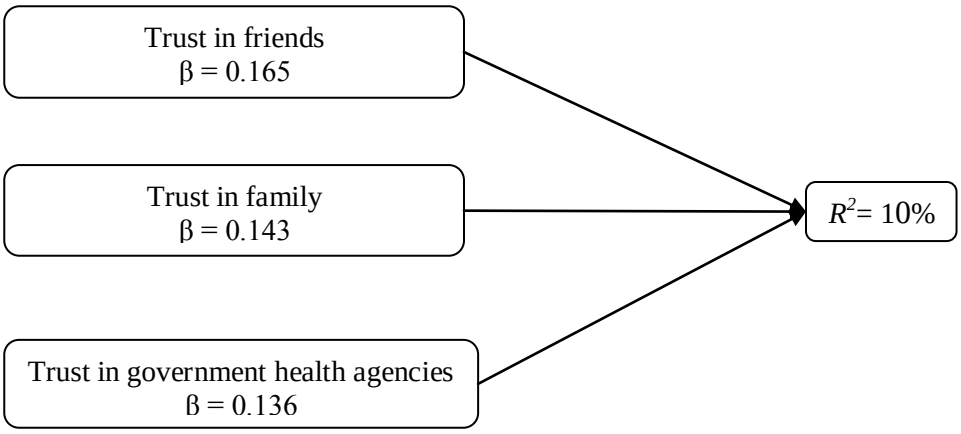

Figure 14. Variables that had a significant contribution to the variance of the *INL* construct.

[22] An estimate of average variability (spread) of a set of data (Field, 2009).

4.7.3 Prediction of variance in the *INLdiscuss* construct

The five independent variables (see Table 17) that correlated significantly with the dependent variable *INL**discuss*** were added in a linear multiple regression model. Only one of the variables showed significant contribution to the explained variance. Trust in international organizations such as the WHO contributed to 4% of the variance in the *INL**discuss*** construct.

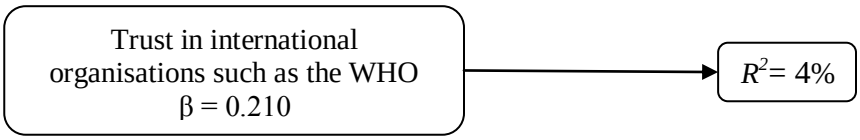

Figure 15. Variables that had a significant contribution to the variance of the *INL**discuss*** construct.

4.7.4 Prediction of variance in the *CNLaction* construct

The six independent variables (see Table 17) that correlated significantly with the dependent variable *CNL**action*** were added in a linear multiple regression model. Only two of the variables showed significant contribution to the explained variance. Trust in health personnel such as doctors, nurses and gender contributed to 8% of the variance.

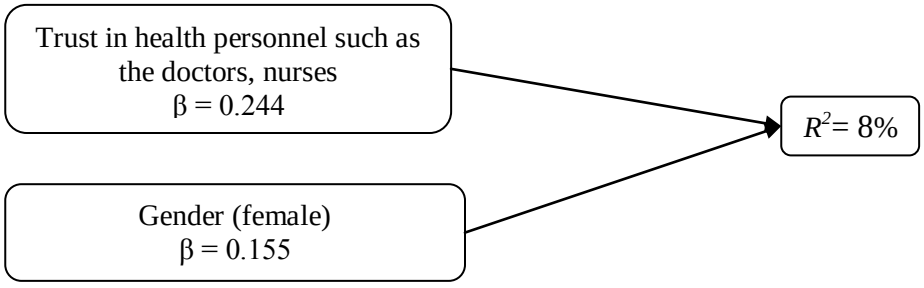

Figure 16. Variables that had a significant contribution to the variance of the *CNL**action*** construct.

4.7.5 Prediction of variance in the *CNLmedia* construct

The seven independent variables (see Table 17) that correlated negatively significantly with the dependent variable *CNL**media*** were added in a linear multiple regression model. Only one of the variables showed significant negative contribution to the explained variance. Not trusting in newspapers or magazines contributed to 5% of the variance.

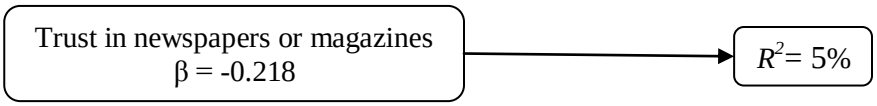

Figure 17. Variables that had a significant contribution to the variance of the *CNL**media*** construct.

4.7.6 Prediction of variance in the *CNLinfluence* construct

Five independent variables (see Table 17) correlated negatively significantly with the dependent variable *CNL**influence*** and were added in a linear multiple regression model. Four of the variables showed significant negative contribution to the explained variance. Not trusting in friends, family, government health agencies and nutritionist or dieticians as sources of nutrition information contributed to 10% of the variance.

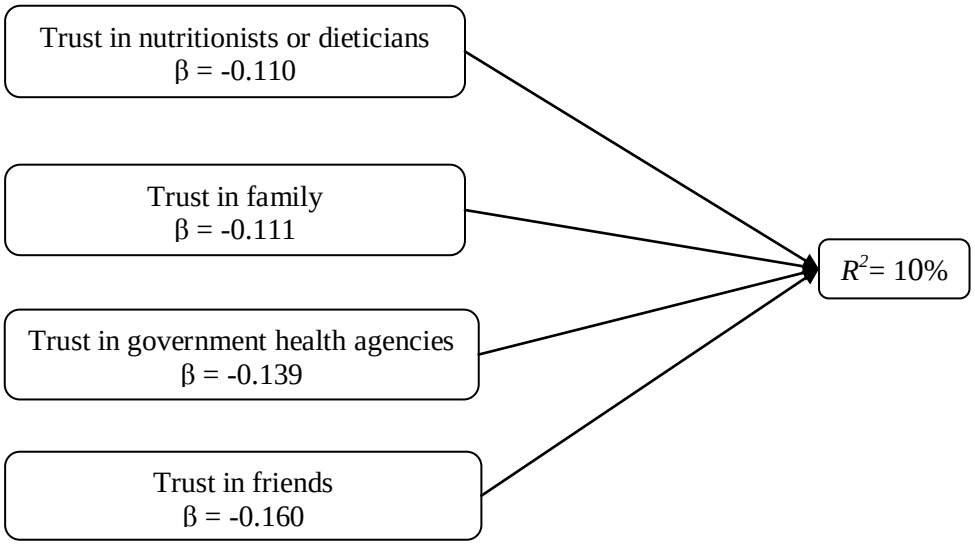

Figure 18. Variables that had a significant contribution to the variance of the *CNL**influence*** construct.

4.7.7 Prediction of variance in the *GrandNL* construct

The two independent variables (see Table 17) that correlated significantly with the dependent variable *GrandNL* were added in a linear multiple regression model. Only one of the variables showed significant contribution to the explained variance. Trust in international organizations such as the WHO as sources of nutrition information contributed to 8% of the variance.

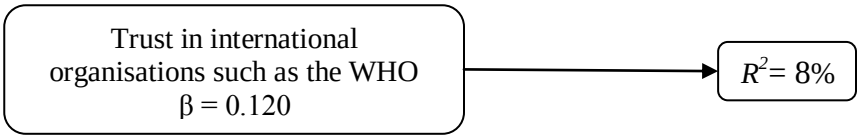

Figure 19. Variables that had a significant contribution to the variance of the *GrandNL* construct.

4.8 Types of media channels used by the adolescent students in seeking nutrition related information

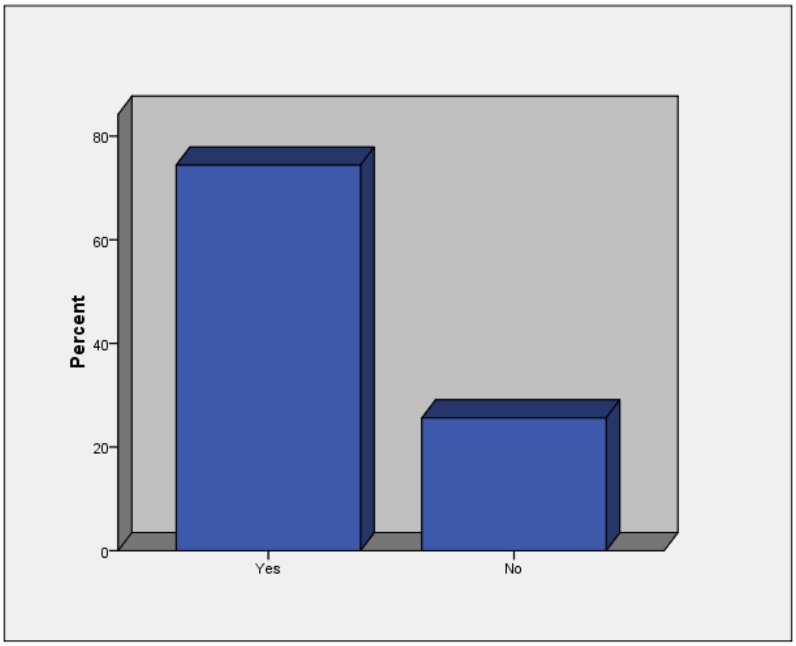

Figure 20. Searched for information about nutrition, diet or food from any source (*N*=500).

Almost three quarters of the adolescent students had ever searched for information about nutrition, diet or food, and the rest had never searched for information about nutrition, diet or food.

4.8.1 Sources of information about nutrition, diet or food

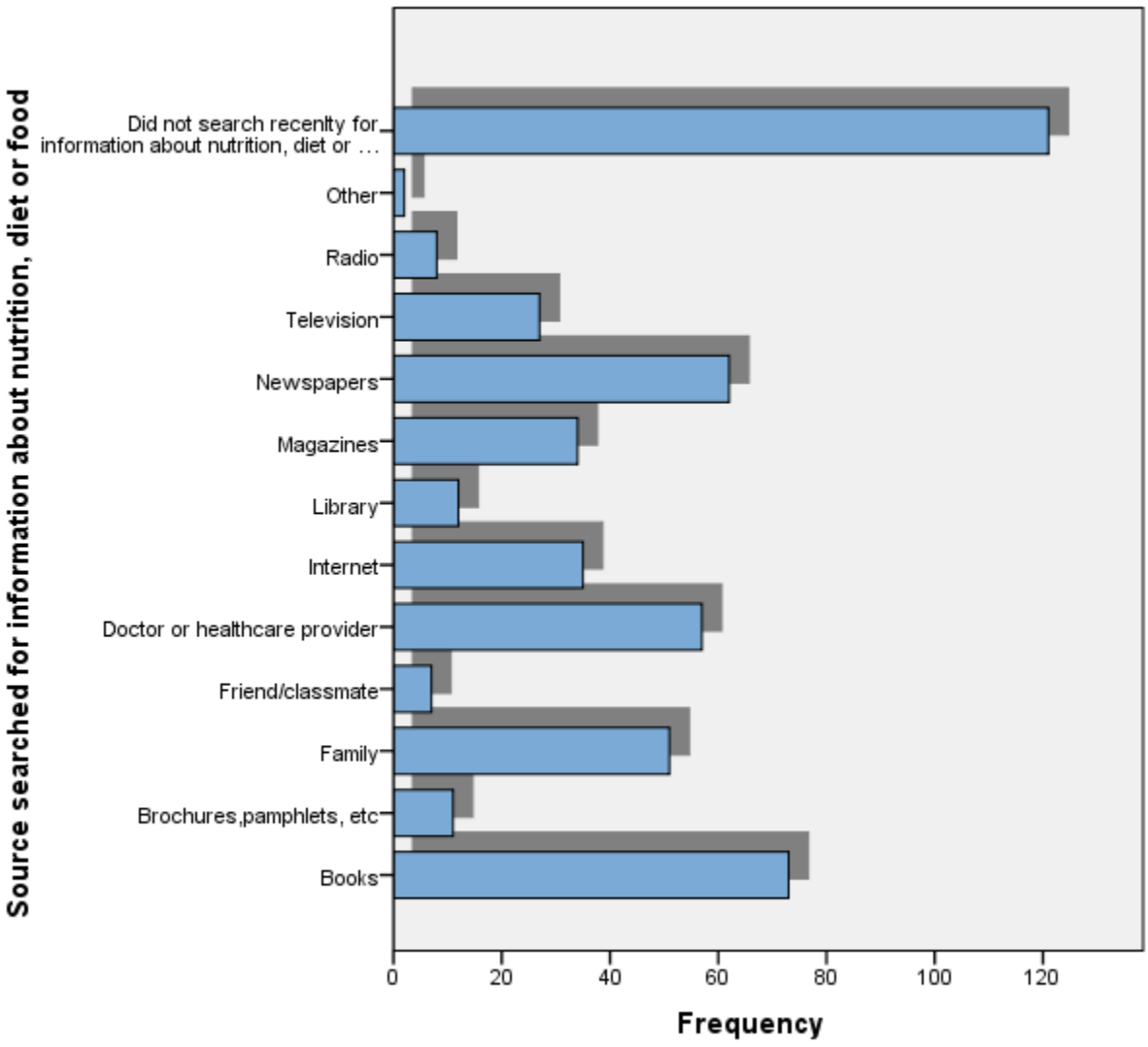

Figure 21. Sources searched for information about nutrition, diet or food (*N*=500).

The majority of adolescent students had not recently searched for information about nutrition, diet or food from any source. Although some of them had recently searched in books, newspapers, from a health care provider, from family members, the internet, magazines, and

from television programmes respectfully. The least searched sources of information were the library, brochures, radio, friends and other sources respectfully.

4.8.2 Level of confidence among the adolescent students in seeking nutrition-related advice or information

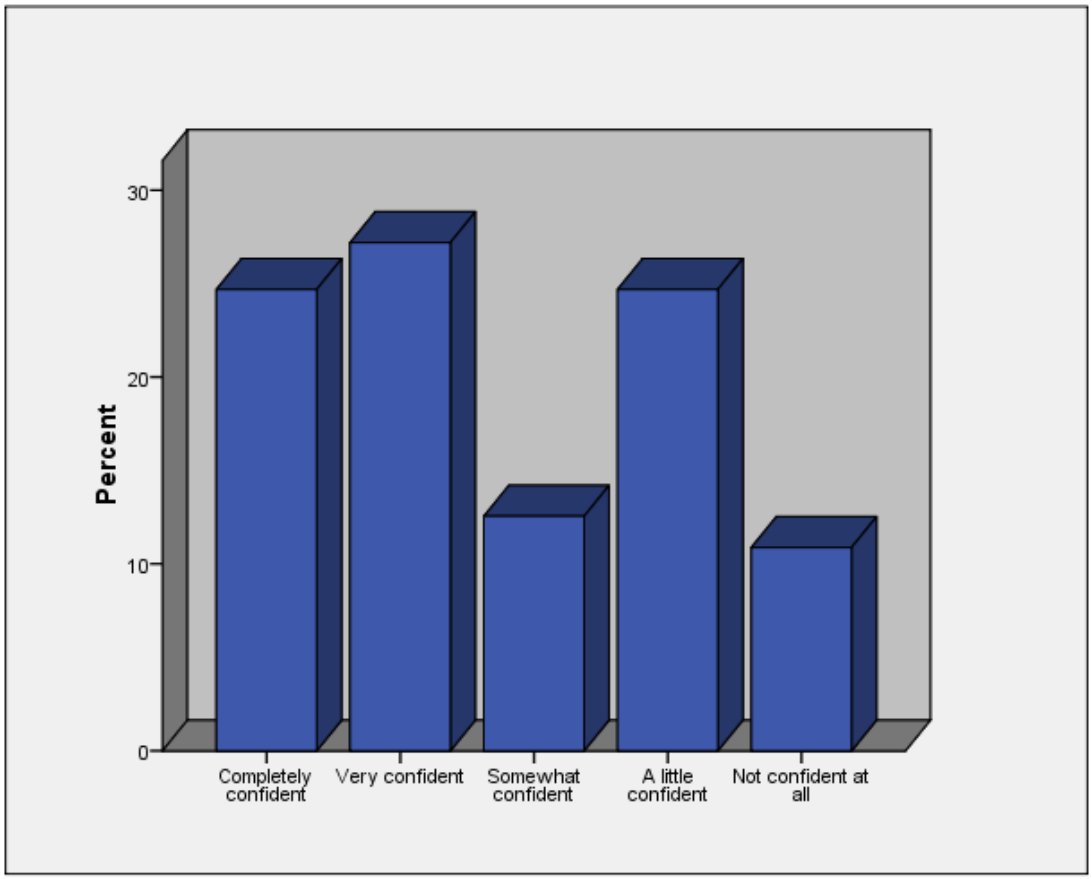

Figure 22. Confidence in seeking nutrition-related advice or information (*N*=487).

Only a quarter of the adolescent students were completely confident that when they needed nutrition-related advice or information they could get it. However, the majority of the adolescent students 27% (130) were very confident, 13% (60) were somewhat confident, 25% (118) were a little confident and 10% (52) were not confident at all. The mean confidence score was (2.70 ± 1.36) therefore on average it can be concluded that the students were somewhat confident that when they needed nutrition-related advice or information they could get it.

4.8.3 Barriers to seeking nutrition information

Table 19. Barriers to seeking nutrition information.

	%					
Barriers to seeking nutrition information	**Strongly Agree**	**Agree**	**Neither agree nor disagree**	**Disagree**	**Strongly disagree**	***N***
It's a lot of effort to get the information.	9 (42)*	27 (127)	8 (35)	38 (174)	19 (86)	464
It is difficult to verify the credibility of the information.	5 (25)	22 (102)	13 (60)	47 (219)	12 (57)	463
The information is difficult to understand.	12 (54)	39 (181)	15 (71)	26 (120)	8 (38)	464
There is a lack of nutrition, diet or food information in other languages apart from English.	22 (104)	35 (161)	9 (43)	21 (96)	13 (60)	464
It takes a lot of time to seek for the information.	9 (42)	29 (134)	7 (33)	39 (183)	16 (72)	464

Note.*(*n*)

Most of the adolescent students strongly agreed that nutrition information was difficult to understand and the lack of nutrition, diet or food information in other languages apart from English as the major barriers to them seeking information about nutrition. Almost half of the adolescent students however disagreed that it is difficult to verify the credibility of nutrition related information.

4.8.3.1 Barriers to seeking nutrition information mean scores

Table 20. Barriers to seeking nutrition information mean scores.

Barriers to seeking nutrition information		
	M* ± *SD	***N***
It is difficult to verify the credibility of the information.	2.61 ± 1.12	463
It's a lot of effort to get the information.	2.71 ± 1.29	464
It takes a lot of time to seek for the information.	2.77 ± 1.27	464
The information is difficult to understand.	3.20 ± 1.19	464
There is a lack of nutrition, diet or food information in other languages apart from English.	3.33 ± 1.37	464

Finding difficulty in verifying the credibility of the information was the barrier with the least mean score. The barriers with the highest mean score were: there is a lack of nutrition, diet or food information in other languages apart from English and that the information is difficult to understand. Another barrier although not included in Table 20 but was cited by the adolescent students was that it is expensive seeking nutrition information, especially when one uses the internet.

4.8.3.2 Differences between the genders in barriers to seeking nutrition information

Table 21. Differences between the genders in barriers to seeking nutrition information.

Barriers to seeking nutrition information	Males		Females		
	M ± SD	***n***	***M ± SD***	***n***	***p-value (t-test)***
It's a lot of effort to get the information.	2.71 ± 1.31	225	2.60 ± 1.26	239	.057
It is difficult to verify the credibility of the information.	2.61 ± 1.12	225	2.63 ± 1.09	238	.732
The information is difficult to understand.	3.20 ± 1.19	225	3.26 ± 1.14	239	.306
There is a lack of nutrition, diet or food information in other languages apart from English.	3.33 ± 1.37	225	3.36 ± 1.37	239	.674
It takes a lot of time to seek for the information.	2.77 ± 1.27	225	2.74 ± 1.23	239	.669

There was no significant difference between the male and female adolescent students regarding the barriers to seeking nutrition information. This therefore implies that they are probably faced with similar barriers when they seek information about nutrition.

4.9 Level of trust in nutrition information sources among the adolescent students

Table 22. Trust in nutrition information sources.

	%					
Trust in nutrition information sources	**Very weakly**	**Weakly**	**Neutral**	**Strongly**	**Very Strongly**	***N***
International organisations such as the World Health Organisation (WHO)	2 (11)*	2 (10)	4 (19)	22 (100)	70 (320)	460
Nutritionist or dietician	2 (9)	6 (26)	7 (34)	30 (137)	55 (256)	462
Doctor, nurse or any other health personnel	3 (13)	4 (17)	8 (39)	40 (186)	45 (207)	462
Government health agencies	4 (16)	11 (49)	8 (38)	36 (167)	41 (191)	461
The internet	4 (18)	5 (25)	15 (69)	38 (176)	38 (173)	461
Television	4 (18)	10 (46)	23 (107)	48 (223)	15 (67)	461
Radio	7 (30)	14 (65)	27 (123)	41 (188)	12 (55)	461
Newspapers or magazines	4 (20)	21 (96)	24 (111)	39 (178)	11 (54)	461
Text books	5 (22)	9 (43)	25 (117)	49 (226)	12 (53)	461
Family	4 (17)	28 (129)	30 (137)	27 (136)	9 (42)	461
Friends	18 (81)	34 (157)	30 (138)	16 (74)	2 (11)	461

*Note.**(*n*)

Over half of the adolescent students very strongly trusted in nutrition information that was from international organizations such the WHO. However, they also very strongly trusted in nutrition information that was from a nutritionist or dietician, health personnel and government health agencies respectively.

4.9.1 Trust in nutrition information sources mean scores

Table 23. Trust in nutrition information sources mean scores.

Trust in nutrition information sources	***M* ± *SD***	***N***
International organisations such as the World Health Organisation (WHO)	4.54 ± 0.87	460
Nutritionist or dietician	4.31 ± 0.97	462
Doctor, nurse or any other health personnel	4.21 ± 0.95	462
Government health agencies	4.02 ± 1.11	461
The internet	4.00 ± 1.05	461
Television	3.60 ± 0.98	461
Text books	3.53 ± 0.98	461
Radio	3.38 ± 1.07	461
Newspapers or magazines	3.32 ± 1.07	461
Family	3.12 ± 1.04	461
Friends	2.52 ± 1.03	461

Trust in international organizations such as WHO had the highest mean score. Trust in nutritionists or dieticians, health personnel such as doctors and government health agencies and the internet also had high mean scores of four and above. However, trust in friends as a source of nutrition information had the least mean score.

4.9.2 Differences between the genders in trust in nutrition information sources

Table 24. Differences between the genders in trust in nutrition information sources.

Trust in nutrition information sources	Males		Females		
	M ± SD	***n***	***M ± SD***	***n***	***p-value (t-test)***
International organizations such as the World Health Organisation (WHO)	4.57 ± 0.90	225	4.51 ± 0.84	236	.44
Nutritionist or dietician	4.41 ± 0.88	226	4.22 ± 1.04	236	.03*
Doctor, nurse or any other health personnel	4.29 ± 0.88	225	4.13 ± 1.00	237	.07
The internet	4.10 ± 1.01	225	3.90 ± 1.07	236	.04*
Government health agencies	4.07 ± 1.11	225	3.96 ± 1.11	236	.29
Television	3.71 ± 0.96	225	3.49 ± 1.00	236	.01*
Text books	3.53 ± 0.98	225	3.53 ± 0.98	236	.96
Radio	3.50 ± 1.04	225	3.25 ± 1.09	236	.01*
Newspapers or magazines	3.36 ± 1.06	225	3.28 ± 1.08	236	.40
Family	3.17 ± 1.03	225	3.08 ± 1.05	236	.32
Friends	2.53 ± 1.04	225	2.50 ± 1.03	236	.80

Note. *significant difference ($p \leq 0.05$)

There was a significant difference between the male and female respondents in trust in nutrition information from nutritionists or dieticians, the internet, television and radio with the male respondents having a higher mean value in all the four sources.

5. Discussion

5.1 Introduction

This chapter is divided into two sections: methodology discussion and results discussion.

The methodology discussion section will deal with the development of the study instrument, its use, the analysis of the collected data, the validity and reliability of the study and ethical aspects of the study.

The results discussion section will deal with the key findings of the study that will be discussed in a chronological sequence following the research questions as listed in section 1.4.

However, this chapter will begin with a summary of the key findings of the study that are highlighted below:

- Exploratory factor analysis led to the development of seven nutrition literacy constructs: *FNL*, *INL*, *INL**discuss***, *CNL**action***, *CNL**media***, *CNL**influence*** and a *GrandNL*. Average scores indicated that the students had moderate levels of *FNL*, *INL*, *INL**discuss***, *CNL**action***, and *GrandNL* but low levels of *CNL**media***, *CNL**influence***.
- There was a significant difference in mean nutrition literacy scores of the *INL**discuss*** and *CNL**action*** constructs between the male and female adolescent students.
- Trust in newspapers or magazines, friends, family, government health agencies, international organisations, health personnel, nutritionists or dieticians and gender contributed to the variance of the nutrition literacy constructs.

Regarding the sub-aims of the study, the following were the key findings:

- About three quarters of the adolescent students had ever searched for information about nutrition, diet or food, although about one quarter had not recently searched for information about nutrition, diet or food from any source.
- The most searched sources for information about nutrition, diet or food were: books, newspapers, health care providers and family members respectfully. Although on average the respondents were only somewhat confident that when they needed nutrition-related advice or information they could get it.
- About two thirds of the adolescent students trusted most in international organisations such as the WHO as a source of nutrition information. And cited on average the lack of

nutrition, diet or food information in other languages apart from English as the major barrier to seeking nutrition information.

5.2 Methodology discussion

The discussion in this section will first focus at the sampling procedure, then data collection, followed by the development of the study tool, certain statistical analyses performed, the validity and reliability of the study and the ethical aspects of the study. It should however be noted that the methodology chapter describes in detail the study site, study design, study population, sample size determination, sampling technique, data collection tools used, data analysis methods used and the ethical considerations of this study.

5.2.1 Sampling procedure

The adolescent students were selected purposively from five secondary schools. Ideally the schools should have been selected randomly so as to give each school an equal chance of being selected (Boslaugh & Watters, 2008). However, my aim was to select day schools (these have students that study at school but return home after lessons). As I believed such schools would be much easier to gain access to than boarding schools (these have students that study at school and live at the school during the school year with other students). If I had used random selection, the probability of having selected a day school from each of the five divisions of Kampala district would have been very low.

Although during the selection of students from the schools, an equal number of students were selected from two randomly selected classes of each of the three secondary grades, as each grade had four classes. Also the frequency of males and females in each of the randomly selected classes was considered when determining the number of males and females to be selected so as to ensure a gender representative sample. However, the students were asked to volunteer to participate in the study as the schools administrations did not allow me access to the class lists which were needed so as to perform simple random sampling.

The total number of respondents was 506 students which was more than the theoretical sample size of 371 (see section 3.4.1). This was so because an additional 40% (148 respondents) was added to cater for non-response bringing the final sample size to 519 respondents. However,

there was a high response rate of 97% thus bringing the total number of study participants to 506, implying that the study was statistically generalizable.

The selection of schools using the non-probability sampling technique of purposive sampling and volunteers may have introduced selection bias in the study. As the students that volunteered to participate in the study could differ in some significant respect than those that did not volunteer (Ary et al., 2010).

5.2.2 Data collection

Data collection was conducted with help of a research assistant. This was during the end of lessons when the students were about to go for a mid-morning break, this was done so as not to interfere with the normal routine of their lessons. Before the questionnaires were distributed, the class teacher introduced me and my research assistant and after briefly introducing ourselves, informing the students what the study was about and that participation was voluntary, the students were then asked to volunteer. However, the presence of the teacher could have compelled some students not only to participate in the study but also answer questions that they didn't understand or have adequate knowledge to answer.

5.2.3 Questionnaire development

The questionnaire was self-administered and close-ended. It comprised of 29 attitude statements some of which were adapted from (Pettersen et al., 2009a). They were grouped under sub-themes of functional, interactive and critical nutrition literacy. The respondents had to indicate their level of agreement or disagreement by ticking where they felt their answer lies on a Likert scale. In order to assess the respondents' ability to obtain nutrition information and exposure to nutrition information, adapted questions from the Health Information National Trends Survey (HINTS) and from Zoellner et al. (2009) study were also included in the questionnaire. Therefore, the questionnaire also included questions about confidence in seeking nutrition information or advice, barriers to seeking nutrition information and level of trust in various sources of nutrition information. The questionnaire was pilot tested and the necessary changes made before the collection of data. The changes were mainly to correct grammatical and numbering errors.

5.2.3.1 Type and format of questions used

A downside to the type and format of questions used, is that in both the HINTS survey and Pettersen et al. (2009a) study, the questions were developed for an American and Norwegian adult sample respectfully and yet my study targeted adolescent students between 10-19 years of age in Uganda (Brug & Klepp, 2007; WHO, 2009). However, I made every effort to ensure that the questions were modified for an adolescent sample and also that the questions were relevant in a Ugandan context. Regarding the format of questions used being closed-ended, despite the fact that they could not provide more insight into whether the students had any clearly personally formulated opinions about the issues being asked, the closed-ended questions made it easier and quicker for the students to answer the questions and also ensured that all the students had the same reference in responding to the questions (Ary et al., 2010).

5.2.3.2 Use of the Likert five-point scale

As earlier mentioned the responses were based on the Likert scale with five options and the students had to tick the option they best felt they agreed with. I decided to use a response scale of five because a study by Preston and Colman (2000) showed that the validity, reliability and discriminating power of scales, were significantly higher for scales with more response categories that were up to seven[23]. However, the internal consistency did not differ significantly between the scales although the test-retest reliability tended to decrease for scale with more than 10 response categories and some researchers have reported higher reliabilities for the five-point scales: (Jenkins & Taber, 1977; Lissitz & Green, 1975; McKelvie, 1978; Remmers & Ewart, 1941) (as cited in Preston & Colman, 2000).

A shortcoming of a five-point Likert scale is that some respondents can select the middle option (neither agree nor disagree) than struggle to make a decision as could have happened in my study (Scott & Mazhindu, 2005). However, different scales are suited for different purposes depending on the circumstances and a five-point scale or even a three-point scale is recommended in circumstances were the respondents have limited time and can easily get frustrated and demotivated or bored (which was the case with my study). Also five-point scales are perceived as relatively quick and easy to use by respondents (Preston & Colman, 2000).

[23] Miller (1956) suggests that people are only able to distinguish about 7±2 different items when making judgments about the magnitude of unidimensional stimuli (as cited in Preston & Colman, 2000).

5.2.4 Demographic information

Few demographic (background) variables apart from age and gender were collected so as to minimise the time needed to complete the questionnaire, there are basically three major reasons for this. Firstly due to the age range of the students 10-19 most would easily get bored and fed up if it took them a long time to complete the questionnaire, secondly as earlier mentioned the data was collected towards the end of lessons as the adolescent students were about to go for their mid-morning break so as not to interfere with their lessons thus if questionnaire took up all of their break time, some would have been tempted to just tick any option so as to finish as fast as possible, however it approximately took them 10-15 minutes therefore they knew they had some time left even after filling the questionnaire. Thirdly, the addition of certain 'sensitive' questions such as their parents' income and educational level would have required written permission from their parents which would have been time consuming. However, I do appreciate the fact that such variables would have provided more insight into the various correlations and differences in the developed nutrition literacy construct scores between the adolescent students.

5.2.5 Development of the FNL, INL and CNL attitude statements

There is limited research that includes measures of nutrition literacy (Diamond, 2007). However, Diamond (2007) developed a measure of nutritional literacy called the Nutritional Literacy Scale (NLS) in adults that is intended to measure an individual's ability to comprehend nutrition information. And Zoellner et al. (2009) did a cross-sectional study to examine the nutrition literacy status of adults in the lower Mississippi Delta. However, it does not measure nutrition literacy according to Nutbeam (2000) hierarchical model.

Some studies do exist that are based on Nutbeam's (2000) hierarchical model such as Ishikawa et al. (2008b) developed and examined the psychometric properties of a scale designed to measure three different levels of health literacy. Kjøllesdal (2009) performed a study with the aim of developing and testing the questionnaire Nutrition Literacy Questionnaire (NLQ).

Another study was done in Norway aimed at assessing nursing students` nutrition knowledge, level of interactive nutrition literacy and critical nutrition literacy, and their ability to request information from a scientific news brief (Dalane, 2011). Blegen (2011) did a study to

determine the nutrition literacy of pupils in year 10 of secondary school also in Norway. Further details of these studies are given in Chapter 2.

The attitude statements as earlier mentioned were inspired by adapted from Norwegian and American studies by Pettersen et al. (2009a) and Zoellner et al. (2009) respectfully. However, they were modified for the target sample of adolescent students (10-19 years of age) and made relevant in a Ugandan context. The questionnaire was pilot tested, although most of the errors cited by the pilot test participants were typing errors and none cited any other problems such as failure to understand the statements. Although during data collection the adolescent students in secondary one asked for clarification about statements 4.7 and 4.9 in the *FNL* sub-theme, implying that some terms such as '*food pyramid*', '*balanced diet*' could have been new to them and thus they found difficulty in answering those statements. But they seemed to comprehend the rest of the attitude statements without difficulty.

Since the study questionnaire had never been validated it makes it difficult to conclude that the attitude statements measured what they actually were intended to measure. It is also difficult to know what a high or low nutrition literacy score is as per my results, hence making comparison of my study results also difficult. But it should be noted that the questionnaire was not intended to measure the comprehensive knowledge of the adolescent students about nutrition, but rather assess their level of nutrition literacy as per the three levels of nutrition literacy: functional nutrition literacy, interactive nutrition literacy and critical nutrition literacy.

5.2.6 Key aspects of the performed statistical analyses

Several statistical analyses were performed on the data. However, only the following are discussed: factor analysis, reliability analysis, correlation analysis and multiple regression analysis.

5.2.6.1 Factor analysis

EFA was used to explore if there were interrelationships among the attitude statements so as to identify those that measured the same underlying factor reflective of the three nutrition literacy levels of functional nutrition literacy, interactive nutrition literacy and critical nutrition literacy. However, before EFA, the data was assessed to find out if it met the criteria in-order for factor analysis to be performed.

The sample size of over 500 was suitable for factor analysis. Missing data analysis was not performed as non of the constructs had missing data that was more than 5% of the total sample size (Tabachnick & Fidell, 2001, 2007). Bartlett's test of sphericity was significant ($p \leq .05$) and that the KMO index was above the minimum value of .600 (Pallant, 2007; Tabachnick & Fidell, 2007). And only those attitude statements that had correlation coefficients greater than 0.300 were considered for factor analysis.

In the development of the *FNL* construct two attitude statements had to be excluded as they had factor loading values less than 0.300. In the development of the *INL* and *CNL* constructs two (5.3 & 5.9) and one (6.10) attitude statements were excluded respectfully as item-total statistics from the SPSS output showed that the CCA value would increase if those attitude statements were dropped. EFA for the *INL* and *CNL* constructs revealed other sub-constructs which were named accordingly depending on the underlying concept within each attitude statement that they comprised of. The sub-constructs that were revealed were *INL**discuss***, and *CNL**action***, *CNL**media*** *CNL**influence***. All the constructs and sub-constructs were also combined into a *GrandNL* construct.

5.2.6.2 Reliability analysis

After the EFA the reliability of the developed constructs was measured by assessing their internal consistency by measuring the CCA using SPSS. A value of above .80 indicates a high level of internal consistency although Nunnally (1978) recommends a minimum value of .70 (Pallant, 2007; Scott & Mazhindu, 2005; Tabachnick & Fidell, 2007). However, the internal consistency was assessed using Hair et al. (2006) recommendation of .60 as the cut off for acceptable reliability. Of the total seven nutrition literacy constructs that were developed three had a CCA value of .60 and above. And these were: the *INL*, *CNL**action***, and *CNL**influence*** constructs, this therefore probably implies that these constructs were reliable as the items or statements that made up these constructs satisfactorily reflected the same theme or construct. The *FNL*, *GrandNL* and the *INL**discuss*** constructs had CCA values less than .60 with the *CNL**media*** construct having the lowest CCA value of .46 (see Table 8).

A possible explanation for the low values CCA values is that CCA values are dependent on the number of items in the scale. And since the scales consisted of few items with the *FNL* and *INL* scales having only nine attitude statements each and the *CNL* scale consisting of 11

attitude statements this could have resulted in lower CCA values. Briggs and Cheek (1986) recommend that in such situations it is better to calculate and report the mean inter-item correlation for the items with the optimal inter-item correlation values ranging from .20 to .40 (as cited in Pallant, 2007). However, this was not done for this study and only CCA values were considered.

5.2.6.3 Correlation analysis

Correlation analysis was also performed to describe the strength and the direction of the linear relationship between the constructs (Pallant, 2007). Since the construct variables were interval in nature and normally distributed, Pearson product-moment coefficient (*r*) which is a parametric correlation technique was used. Cohen (1988, pp. 79-81) (as cited in Pallant, 2007) suggests $r = .10$ to .29 as a small correlation, $r = .30$ to .49 as a medium correlation and $r = .50$ to 1 as a large correlation.

The strongest ($r = .67$) and significant ($p \leq .01$) correlation was that between the *INL**discuss*** and *GrandNL* constructs. The weakest ($r = .09$) and significant ($p \leq .05$) correlation was that between the *FNL* and *CNL**media*** constructs. All the constructs were significantly positively correlated to the *GrandNL*. However, I should emphasize that correlation statistics measure only association and not causality (Boslaugh & Watters, 2008).

5.2.6.4 Multiple regression analysis

Multiple regression analysis was done to find out which independent variables (age, class, gender and trust in sources of nutrition information) explained the total variance in the constructs (dependent variables). Therefore, a bivariate Pearson's correlation analysis was performed to determine the strength and the direction of the relationship between the constructs and the independent variables. Only those independent variables that significantly correlated with the dependent variables were used in the multiple regression analysis.

Several authors have different options regarding the number of cases required for multiple regression for the results to be generalizable. Stevens (1996) recommends that 15 respondents per predictor are adequate (as cited in Pallant, 2007). However, Tabachnick and Fidell (2007) suggest calculating the samples size requirements using the formula: $N > 50 + 8m$ (where m = number of independent variables). The sample used was adequate as per the two

mentioned recommendations. The multicollinearity[24] and singularity[25] of the independent variables was also checked.

Only one independent variable was used for the *FNL* construct, four for the *INL*, five for the *INL**discuss***, six for the *CNL**action***, seven for the *CNL**media***, five for the *CNL**influence*** and two for the *GrandNL*.

5.2.7 Validity of the study

Validity of a scale or questionnaire refers to the extent to which it measures what it is supposed to measure. Validity consists of majorly two general categories: internal validity and external validity, however other types exist: statistical conclusion validity[26], predictive validity[27], criterion-related validity, face validity, content validity and construct validity[28] (Ary et al., 2010; Pallant, 2007; Scott & Mazhindu, 2005). The types of validity are explained in section 3.6.1. Although some of the key issues regarding the study's validity are discussed in the following sub-sections:

5.2.7.1 Internal validity

Internal validity can be defined as the inferences about whether the changes observed in a dependent variable are caused by the independent variable and not some extraneous factors. One of the ways of dealing with internal validity is to control for or trying to minimise the factors/threats that can affect the internal validity of the study as total elimination of all the possible treats can rarely be obtained (Ary et al., 2010). Am aware that by purposively selecting the schools and using volunteers the internal validity of my study could have been affected negatively; however I controlled for this by randomly selecting the classes from which the respondents were selected, also a secondary school was selected from each of the five divisions of the study site so as to ensure geographical representability.

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[24] Is the relationship among the independent variables and exits when the independent variables are highly correlated ($r \geq .9$) (Pallant, 2007).

[25] This occurs when one independent variable is a combination of other independent variables (Pallant, 2007).

[26] Refers to the validity of the inferences about the covariation between treatment and outcome (Ary et al., 2010).

[27] Refers to the ability of the study instrument or tool to predict some criterion observed at a future date with the data collected on the criterion variable at a different time but on the same subjects (Scott & Mazhindu, 2005).

[28] Refers to the validity of the inferences about psychological constructs involved in the subjects, settings, treatments, and observation used in the experiment (Ary et al., 2010).

5.2.7.2 External validity

External validity of the study refers to the extent to which the findings of the study can be generalized to other subjects, settings and treatments (Ary et al., 2010). I controlled for the threats to the external validity of my study by randomly selecting the classes from which the respondents were selected, also a secondary school was selected from each of the five divisions of Kampala district, also the total sample size of 506 respondents was adequate and well beyond the calculated representative sample size of 371 respondents.

5.2.7.3 Criterion-related validity

Criterion-related validity is a strong form of validity as it measures the ability to compare quality to another already validated measuring tool or questionnaire. However, since no other questionnaire developed for same target group (adolescents) and relevant to a Ugandan context exits, the criterion-related validity of the questionnaire could not be established (Scott & Mazhindu, 2005).

5.2.7.4 Face validity

Face validity was achieved by asking an expert to assess if the content reflected the theme under investigation and also whether the questions were accurate and complete (Scott & Mazhindu, 2005).

5.2.7.5 Content validity

Content validity concerns the representativeness of the questions used in the scale or questionnaire. It was achieved by performing a literature review of the topic before constructing the questionnaire so as to ensure that the questions adequately sampled the content that was being investigated (Scott & Mazhindu, 2005).

5.2.7.6 Construct validity

Construct validity is the most difficult type of validity to measure. It is concerned with establishing acceptance that a construct measures what it claims to, thus there needs to be a clear objective criteria to measure the construct. As already mentioned the concept of nutrition literacy is still relatively new, therefore a clear and generally accepted criteria for measuring nutrition

literacy is still in the works. However, according to Fitzpatrick et al. (1998) factor analysis can be considered as an aspect of construct validity. As earlier mentioned EFA was performed in this study so as to establish if the attitude statements measured the three levels of nutrition literacy according to Pettersen et al. (2009a) based on Nutbeam (2000) hierarchical model of health literacy. In order to assess the construct validity of my questionnaire I considered the factor loadings. The factor loadings were moderately high for all the constructs although for the *FNL* construct two of attitude statements had to be excluded due to the low factor loadings (<0.300), (see Table 5).

5.2.8 Reliability of the study

Reliability of a study instrument or tool is the degree of consistency with which it measures whatever it is measuring. It is concerned with the effect of error on the consistency of scores. Random errors of measurement (happen due to chance) are the major source of reliability problems in studies (Ary et al., 2010; Pallant, 2007; Scott & Mazhindu, 2005; Tabachnick & Fidell, 2007).

Sources of random or chance errors can be: the respondent themselves, the instrument and also how the instrument is administered. Random errors are difficult to control for as they happen by chance, however I tried to minimise them by ensuring the following:

- The adolescent students were guided on how to answer the questionnaire properly.
- Questionnaires were properly administered to the adolescent students.
- Questionnaires were properly coded before data entry into SPSS.
- The data was double-checked as it was being entered into SPSS.
- Descriptive statistics of the variables were run so as to spot any abnormal values (data cleaning).
- Proper interpretation of the data was done with the help of an experienced supervisor in the field of nutrition literacy.

The second aspect of reliability that was assessed was the internal consistency of the developed constructs using CCA as mentioned in section 3.6.2.3 of the methodology chapter.

5.3 Ethical considerations

Ethical principles that govern research involving human respondents were followed, as approval and permission was obtained from all the relevant authorities before the collection of data. Clearance and approval was sought from the Norwegian Social Science Data Services (see Appendix D), the Uganda National Council for Science and Technology (UNCST) (see Appendix E), Ministry of Education & Sports (see Appendix F) and Office of the President of the Republic of Uganda (see Appendix G). At the schools, approval and permission was sought from the head teachers. Also all respondents of the study were fully informed of the aim of the study, and that the study was solely for academic purposes and their participation was voluntary, before written informed consent was requested from them. All measures were undertaken to ensure the confidentiality and anonymity of the respondents firstly by not requesting the names of the respondents but rather using numerical identities. Also the schools that participated were coded and assigned a number only I the researcher knew. All ‘hard’ data was kept in a sure place and ‘soft’ data on a laptop and backed up on an external hard disk which were all password protected.

5.4 Results discussion

The results discussion section will deal with the key findings of the study that will be discussed in a chronological sequence following the research questions as listed in section 1.4.

It should be noted that most of the comparisons that I will make between my results and other studies will be with those in the field of health literacy. The main reason for this is that few studies about nutrition literacy do exist, however as nutrition literacy 'borrows' much from the field of health literacy, the two fields can be said to overlap in some aspects (Silk et al., 2008).

5.4.1 Levels of functional, interactive and critical nutrition literacy

A total of seven nutrition literacy constructs were developed from the collected data after performing EFA: *FNL*, *INL*, *INL**discuss***, *CNL**action***, *CNL**media***, *CNL**influence*** and *GrandNL*. The results and their possible implications are further discussed under the relevant sub-headings below. However, it should be noted that any implications, suggestions and conclusions I made from the data should be taken cautiously as the developed constructs had low CCA values and few items:

5.4.1.1 Level of *FNL*

The *FNL* theme comprised of nine attitude statements, however, After EFA two attitude statements 4.7 (*I am familiar with the food pyramid*) and 4.9 (*I am familiar with the concept of a balanced diet*) were eliminated as they each had a factor loading of less than 0.300. This did not come as a surprise as during the data collection, most the students asked for clarification about the terms 'food pyramid' and 'balanced diet' especially the secondary one adolescent students, they thus seemed not to comprehend these two terms. A food pyramid is a pyramid shaped diagrammatic representation of the recommended number of servings from each of the food groups to be eaten each day. While a balanced diet can be defined as a diet that contains appropriate amounts of all nutrients from all the major food groups (Bender & Bender, 2005).

As earlier mentioned functional nutrition literacy is having the basic reading and writing skills necessary to understand and follow simple nutrition messages (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008). However, in my study I defined the *FNL* construct as the extent to which an individual experiences difficulty in understanding and comprehending nutrition messages. These two terms (food pyramid and balanced diet) are key words in nutrition and

provide a foundation for the understanding of the basics of nutrition. Therefore, their misinterpretation and/or failure to understand them can eventually contribute negatively to the adolescent students understanding of nutrition messages and thus affect their eating habits (Boehl, 2007). The adolescent students difficulty in understanding nutrition information was made further evident by attitude statement 4.3 (*When I read information about nutrition, food or diet I find it difficult to understand*) *(scale reversed)*, having the highest score, possibly implying that the adolescent students find difficulty in understanding nutrition information and thus not likely to understand nutrition messages and therefore may not be able to or find difficulty in implementing any nutrition-related recommended changes.

The attitude statement with the lowest score was 4.8 (*When I read an article about nutrition, food or diet I find words that I don't know) (scale reversed*). This could imply that the adolescent students generally don't find words that they don't know when they read materials about nutrition, food or diet. However, this seems contrary to what I have just explained in the previous paragraph that some of the adolescent students seemed to find difficulty with certain words (food pyramid and balanced diet). A possible explanation could be that, even though the adolescent students know most of the nutrition-related words, the problem could lie in collective interpretation of the words in a way that makes them understand the message in its entirety.

The reliability of the *FNL* construct was measured by assessing its internal consistency using the CCA. The CCA value was .56 a value below the minimum recommended value of .60 (Hair et al., 2006). As earlier mentioned this could have been due to the few attitude statements (< 10) used in the scale (Pallant, 2007). It could also be due to inconsistency in the adolescent students' attitudes towards single items. That means that the attitude statements used may not reflect dimensions of the *FNL* phenomenon very well.

On average the adolescent students had a moderate score on the *FNL* construct (3.07 ± 0.67). As measured by the *FNL* construct items of this thesis. My results are similar to a master thesis study done to determine the nutrition literacy of pupils in year 10 of secondary school, the results showed that the students also had a relatively high average score of 3.25 ± 0.56 (Blegen, 2011). This comparison should be taken lightly as this study was done in Norway. There were no significant differences in the mean *FNL* score between the genders. Even though the functional nutrition literacy was moderate it was still not adequate. Inadequate functional nutrition literacy like inadequate functional health literacy can have serious consequences on an individual's

health, such as affecting an individual's ability to understand the basics of a disease, self-management skills and pose as a major barrier to educating the individual. This may explain why some patient education programmes have failed (Baker, Williams, Parker, Gazmararian, & Nurss, 1999; Kalichman & Rompa, 2000; Williams et al., 1998a; Williams, Baker, Parker, & Nurss, 1998b). Low functional health/nutrition literacy can have even more severe consequences on an individual with a recent study by Bostock and Steptoe (2012) indicating that low functional health literacy is associated with higher mortality in older adults.

5.4.1.2 Level of *INL*

Interactive nutrition literacy can be defined as more advanced literacy compared to functional nutrition literacy. Interactive nutrition literacy includes the cognitive and interpersonal skills needed to manage nutrition issues in partnership with professionals (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008).

The *INL* theme also comprised of nine attitude statements, two attitude statements 5.5 (*I don't follow public debate about diet for example on television, radio*) and 5.8 (*When I want information about diet I do not know which departments within the health service that I can go to for help*) were eliminated as item-total statistics of SPSS showed that by eliminating them the CCA value would increase. After EFA, six attitude statements were used to develop the *INL* construct. One other construct (*INL**discuss***) was revealed comprising of two attitude statements.

INL construct

The CCA value of the *INL* construct was .63 a value above the recommended .60 value (Hair et al., 2006), and also the highest of all the developed constructs. With a CCA value of .63 this means that six attitude statements used satisfactorily reflect the underlying construct of *INL* though not strongly.

The attitude statements with the highest scores were statements 5.3 (*I discuss about diet with my friends, family and relatives*) and statement 5.4 (*I have changed my eating habits based on the information about diet that I have gathered*). This could imply that the adolescent students are willing to undertake changes regarding their eating habits based on nutrition information, this provides an opportunity for nutrition educators and other health personnel to influence adolescents to take up healthy eating habits which can probably 'stay' with them into adulthood. The lowest score was that of statement 5.2 (*I use the internet when I am looking for information*

about nutrition such as diet). Internet access and use is still relatively limited and expensive in Uganda, in fact as I will later discuss the adolescent students cited internet use being expensive as a barrier to seeking nutrition-related information.

On average the adolescent students had a moderate *INL* score of 3.16 ± 0.76 as measured by the *INL* construct items of this thesis. Therefore, the adolescent students might have moderate cognitive ability and interpersonal skills needed to manage nutrition issues in partnership with professionals, as indicated by the construct scores (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008). My *INL* construct results are higher than those of Blegen (2011) master thesis study as the year 10 secondary school students had a low average score of 2.96 ± 0.65. Again this comparison should be taken lightly as her study was done in Norway.

*INL**discuss** construct*

The *INL**discuss*** construct comprised of two attitude statements 5.3. (*I discuss about diet with my friends, family and relatives*) and 5.9. (*I have discussed my thoughts about diet to someone else (for example my friends, family, relatives, a doctor, nurse or the like*). The *INL**discuss*** construct can be described as the willingness to discuss nutrition-related issues with other individuals such as family, friends and professionals (nutritionists, dieticians) (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008). The CCA value of *INL**discuss*** construct was .51, value below the recommended .60 value (Hair et al., 2006). This means that the attitude statements used did not fully reflect the underlying construct of *INL**discuss***.

The students also had a moderate mean score on the *INL**discuss*** construct (3.64 ± 0.97). However, there was a significant difference ($p \leq .05$) in mean *INL**discuss*** scores between the male (3.55 ± 0.98) and female (3.72 ± 0.95) adolescent students. This probably implies that the female adolescent students are more willing to discuss nutrition-related issues with other individuals such as family, friends and professionals (nutritionists, dieticians) compared to the male adolescent students. These results are also similar to Blegen (2011), master's thesis study which also found a significant difference in the mean *INL* score between the male and female students with the females having the highest score also. These results support the theory that males are less likely to use health services and seek help from health professionals in comparison with their female counterparts (Galdas, Cheater, & Marshall, 2005). They also concur with

Wagner, Knight, Steptoe, and Wardle (2007) study that associated limited health literacy with being male.

5.4.1.3 Level of *CNL*

Critical nutrition literacy is the ability to analyse nutrition information critically, increase awareness, and participate in actions to address barriers (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008). The *CNL* theme comprised of eleven attitude statements. After EFA, six attitude statements were used to develop the *CNL**action*** construct. Two other constructs (*CNL**media*** and *CNL**influence***) were revealed comprising of two attitude statements each. Statement 6.10 (*I find it difficult to distinguish scientific information from non-scientific information about diet*) was eliminated as item-total statistics of SPSS showed that by eliminating it the CCA value would increase.

*CNL**action** construct*

*CNL**action*** can be defined an individual's willingness to take action to improve nutritional aspects ranging from a personal level, national level up to an international level (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008). The reliability of the *CNL**action*** construct was measured by assessing its internal consistency using the CCA. The CCA value was .62. a value above the recommended .60 value (Hair et al., 2006). This means that the six attitude statements used reasonably reflected the underlying construct of *CNL**action***, however not strongly.

The highest score was that of statement 6.3 (*I expect my school to serve healthy food*). This is encouraging as this suggests that the adolescent students expect and want their school to serve them healthy food and are thus more likely to request their school to do so, although there is need for further inquiry on whether the schools are in position to provide healthy food to their students and if they (schools) are willing to provide healthy food to their students. Also if the students know what healthy food comprises of.

The lowest score was that of statement 6.1. (*I would readily get involved in political issues targeted at improving people's diet in Uganda*). A low score on statement 6.1 is not very surprising as the adolescent students may view themselves as being young and consider politics as an activity for adults. On average the adolescent students had a relatively high *CNL**action***

score of 3.97 ± 0.63 and were thus more likely to be able and willing to take action to improve nutritional aspects ranging from a personal level, national and international level.

There was a significant difference in the mean *CNL**action*** construct scores between the male and female students. The females had the highest score (4.04 ± 0.64) compared to the males (3.09 ± 0.61). Again these results are similar with Blegen (2011) study and also concur with Wagner et al. (2007) study that associated limited health literacy with being male.

*CNL**media** construct*

The demand for nutrition information has grown over the years, as people are getting more concerned about their health. The media in form of magazines, newspapers, radio, television and the internet, are one of the major sources of scientific information about health and nutrition to the general public (Fernandez-Celemin & Jung, 2006). Therefore, the way emerging nutrition information is communicated by the media can have serious effects on the public well-being. However, it should be noted that the main role of the media is often not to educate, but as commercial enterprises to sell more papers and attract more viewers, hence sometimes the media may make reports that are often not true or seriously flawed (Fernandez-Celemin & Jung, 2006; McCannon, 2005). This therefore necessitates the consumer (public) to be able to critically evaluate the claims made by media basing on sound scientific principles so as to make informed choices.

All the statements of the *CNL**media*** construct had low scores that were below the average (three). Therefore, the mean score of the *CNL**media*** construct was low (2.48 ± 0.91). Hence this score suggests that the adolescent students are unlikely to evaluate nutritional claims made by media basing on sound scientific principles. This probably implies that they are more likely to make poor nutrition-related choices basing on the information obtained from the various media channels (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008). However, the CCA value of the *CNL**media*** construct was .46. a value below the recommended .60 value (Hair et al., 2006). This means that the two attitude statements used did not fully reflect the underlying construct of *CNL**media***.

*CNL**influence** construct*

All statement mean scores of the *CNL**influence*** construct were relatively low. The mean score of the *CNL**influence*** construct was 2.57 ± 1.02. This low score also probably suggests that

the adolescent students' dietary habits are easily influenced by other individuals and the media (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008). The downside to this is that the adolescent students are likely to adopt unhealthy eating habits from their peers, role models such as actors, musicians, or from several media sources such as television. Bibiloni et al. (2010) found that attention to mass media was a risk factor for obesity among adolescents in the Balearic Islands. One of the reasons is that most food adverts on television which often target children specifically are about processed, energy dense and nutrient deficient 'junk' food. Also, watching of television has been associated with consumption of sweetened beverages and other 'socially prestigious' foods and drinks which are often unhealthy with detrimental effects on one's nutritional status (Ebbeling, Pawlak, & Ludwig, 2002; Fernández, 2006; Jackson, Djafarian, Stewart, & Speakman, 2009; Ochoa, Moreno-Aliaga, Martínez-González, Martínez, & Marti, 2007; Vioque, Torres, & Quiles, 2000). The CCA value of the *CNL**influence*** construct was .60 the same as the recommended .60 value (Hair et al., 2006). This means that the two attitude statements used might reflect the underlying construct of *CNL**influence***.

5.4.1.4 *GrandNL* construct

Since all the constructs were significantly positively correlated to the grand nutrition literacy construct (*GrandNL*). All the attitude statements of the rest of developed nutrition literacy constructs that had a factor loading of 0.300 or more were used to develop a *GrandNL* construct. *GrandNL* can be described as an individual's overall nutrition literacy. It is the totality of functional, interactive and critical nutrition literacy (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008). On average the adolescent students had a moderate *GrandNL* score of 3.15 ± 0.34. However, the CCA value of the *GrandNL* construct was .54. a value below the recommended .60 value (Hair et al., 2006). This means that the attitude statements used might not strongly reflect the underlying construct of grand nutrition literacy, thus implying the need to modify the used attitude statements so as to improve on their reliability.

5.4.2 Correlation between the nutrition literacy constructs

Cohen (1988) (as cited in Pallant, 2007) suggests r = .10 to .29 as a small correlation, r = .30 to .49 as a medium correlation and r = .50 to 1 as a large correlation. As seen in Table 16 correlations between the constructs were not strong and as I earlier mentioned correlation does

not necessarily imply causation. Therefore, the correlations between the constructs and the associations that I imply from them should be taken cautiously.

*CNL**influence*** was significantly negatively correlated with all the other constructs, expect with *CNL**media*** with which it was positively correlated. As earlier mentioned *CNL**influence*** is the measure of an individual's dietary habits to be influenced by other individuals and media. This hence implies that the more an individual is *FNL, INL, INL**discuss*** and *CNL**action*** literate the less likely that their dietary habits will be influenced by other individuals and media. However, a positive significant correlation between the *CNL**influence*** and *CNL**media*** constructs implies that as an individual's knowledge to evaluate nutritional claims made by media basing on sound scientific principles increases so does the influence by other individuals and media on their dietary habits. The assumption I make for this correlation is that the change is a positive change, meaning that the individual after evaluating the nutritional claims he or she then makes an informed choice for healthier eating habits.

The *CNL**action*** construct was positively correlated to the *INL* and *INL**discuss*** constructs. This implies that an individual will be more willing to take action to improve nutritional aspects ranging from a personal level, national level up to an international level if they have the interpersonal skills needed to manage nutrition issues in collaboration with other individuals and are also willing to discuss nutrition issues with other individuals.

The *INL**discuss*** was significantly negatively correlated to the *CNL**influence*** construct. This probably means that as an individual becomes more willing to discuss nutrition issues with other individuals then their dietary habits are less likely to be influenced by other individuals and the media.

The *INL* construct was significantly positively correlated to the *GrandNL, FNL, INL**discuss***, and *CNL**action***. This probably means that more an individual is *GrandNL, FNL, INL**discuss*** and *CNL**action*** literate, the more likely they have the interpersonal skills needed to manage nutrition issues collaborations with other individuals. However, it was negatively correlated to the *CNL**influence*** and *CNL**media*** constructs. This means that an individual with high *CNL**influence*** and *CNL**media*** probably has low *INL*.

The *FNL* construct was significantly positively correlated to the *INL* construct possibly implying that when one has the basic skills required to comprehend and follow nutrition messages, they also most likely have the interpersonal skills needed to manage nutrition issues in

collaboration with other individuals. However, the *FNL* construct was negatively correlated to the *CNL**influence*** and *CNL**media*** constructs. This suggests that when an individual has low functional nutrition literacy, then probably their dietary habits can be influenced by other individuals and the media. Also, they lack the knowledge to evaluate nutritional claims made by the media basing on sound scientific principles.

5.4.3 Predictors of variance in the nutrition literacy constructs

The predictors (the independent variables) of the fraction of total variance in the constructs *FNL*, *INL*, *INL***discuss**, *CNL**action***, *CNL**influence***, *CNL**media*** and the *GrandNL* (the dependent variables) among the adolescent students will be discussed in this section, but only significant predictors will be dealt with and even though some of the predictors appear in more than one of the constructs (see section 4.6.1), they will be discussed only once.

5.4.3.1 Trust in newspapers or magazines

Trust in newspapers or magazines as sources of nutrition information significantly predicted 1% of the variance in the *FNL* construct. However, not trusting in newspapers or magazines significantly predicted 5% of the variance in the *CNL**media*** construct. As earlier mentioned the media are often geared towards selling more papers and attracting more viewers, hence sometimes their reports or information is often seriously flawed (Fernandez-Celemin & Jung, 2006). This therefore requires an individual to critically evaluate the claims made by media. In this thesis a *CNL**media*** literate individual was defined as being able to evaluate nutritional claims made by media basing on sound scientific principles. This therefore implies that individuals that do not trust in newspapers or magazines as sources of information about nutrition, diet or food, probably have a high *CNL**media***. Therefore, they can critically evaluate nutrition claims made by media and probably don't rely on them, but rather seek nutrition-related information from more reliable sources such as health professionals and scientific journals. Compared to individuals with only *FNL* who may have the basic skills required to comprehend and follow nutrition messages in newspapers or magazines but lack the knowledge to evaluate the messages basing on sound scientific principles. This means that such individuals are more likely to take nutritional claims made by newspapers or magazines as 'gospel' truth which can have serious consequences. Though Zoellner et al. (2009) study revealed that individuals with

lower nutrition literacy rated their trust in print sources (including newspapers and magazines) lower than those in higher nutrition literacy categories.

5.4.3.2 Gender

Gender was a significant predictor of variance in the *CNL**action*** construct. This comes as no surprise as there was a significant difference in the mean *CNL**action*** construct scores between the male and female students. The females had the highest score (4.04 ± 0.64) compared to the males (3.09 ± 0.61). These results are supported by Pettersen, Kjøllesdal, and Mosdøl (2009b) study which found being female was a strong predictor of variance in the *FNL* and *CNL**action*** constructs. Wagner et al. (2007) study also found that men were more likely than women to fall into the limited health literacy category. Also men are less likely to seek help from health professionals and use health services (Addis & Mahalik, 2003; Annandale & Hunt, 1990; Galdas et al., 2005). The diet of women is often more consistent with dietary guidelines and thus healthier than that of men as women are generally better informed about health matters than men. And since many women are probably responsible for the diet of their families this can have a positive influence on the families' dietary habits (Abbott, 1997; Inglis, Ball, & Crawford, 2005).

5.4.3.3 Family

Trust in family as a source of information about nutrition, diet or food, was a significant predictor of variance in the *INL* construct. This probably implies that family can influence one's cognitive ability and interpersonal skills needed to manage nutrition issues in partnership with professionals (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008). Parents may not only have an influence on the health literacy of adolescents, but their health literacy can also directly impact health outcomes of the adolescents (Manganello, 2008). Blegen (2011) in her master thesis study also found that family was a significant predictor of variance in the *CNL* construct.

Family has for a long time been pivotal in the study of adolescents' attitudes and behaviour (Cheung, 1997). Family socioeconomic status and educational level especially the mother's educational level has also been shown to have an effect on a child's dietary habits. Children from well-educated and wealthy families tend to consume less sugar and processed fast foods and more protein, fruits, vegetables, and dairy products. While children from less privileged families tend to consume more fat, sugar and processed fast foods (Fernández, 2006).

Parents seem to have a role in transmitting socio-cultural messages regarding the ideal body to adolescents. Parent-child interactions and parental education level have also been associated with behaviours related to risk of obesity and prevalence of obesity in boys and girls respectfully (Bibiloni et al., 2010; Ebbeling et al., 2002; McCabe & Ricciardelli, 2001).

However, not trusting in family was a significant predictor of the variance in the *CNL**influence*** construct. This probably means that by not trusting family as a source of information about nutrition, diet or food, a person's dietary habits may not be easily influenced by other individuals or the media (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008). According to Pettersen et al. (2009a) hierarchical model of nutrition literacy, an individual at the *CNL* level is expected to have the ability to analyse nutrition information critically, increase awareness, and participate in action to address barriers (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008). Therefore, they are more likely to trust information about nutrition, diet or food coming from a health professional or scientific journal compared to that from family members.

5.4.3.4 Friends

Trusting in friends as a source of information about nutrition, diet or food was a significant predictor of variance in the *INL* construct. This probably implies that friends can influence one's cognitive ability and interpersonal skills needed to manage nutrition issues in partnership with professionals (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008). For adolescents, friends or peers are the most important context in which the learning and reinforcement of values and behaviours takes place. This should not be taken lightly as the peer group influence competes with the family and school domains in affecting the adolescent's attitude, literacy and health behaviour (Cheung, 1997; Manganello, 2008; Prinstein, Meade, & Cohen, 2003). McCabe and Ricciardelli (2001) found that male peers encouraged their colleagues with low BMI to gain weight and increase muscle tone, on the other hand the female peers encouraged weight loss regardless of BMI.

However, not trusting in friends was a significant predictor of the variance in the *CNL**influence*** construct. This probably means that by not trusting friends as a source of information about nutrition, diet or food, a person's dietary habits may not be easily influenced by other individuals or the media (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008). This result supports Pettersen et al. (2009a) hierarchical model of nutrition literacy, as an individual at

the *CNL* level is expected to have the ability to analyse nutrition information critically, increase awareness, and participate in action to address barriers (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008). Therefore, they are more likely to trust information about nutrition, diet or food coming from a reputable source such as a health professional or scientific journal compared to that from friends.

5.4.3.5 Health personnel

Trust in health personnel such as doctors, nurses as a source of information about nutrition, diet or food, was a significant predictor of variance in the *CNL**action*** construct. This means that an individual who trusts nutrition information from a health personnel or professional such as a doctor or nurse probably is more willing to take action to improve nutritional aspects ranging from a personal level, national level, up to an international level (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008).

Ishikawa et al. (2008b) claim that with the increase of media reports and easy access to information via the internet, other sources apart from physicians are becoming the primary source of health and medical information. Recent studies in the United States and Canada show that the majority of internet users seek health information (Benigeri & Pluye, 2003). Also the Kaiser Family Foundation's 2001 survey found that 75% of 'online youth' had ever sought health information (Gray et al., 2005). However, in Hesse et al. (2005) study, a high level of trust was expressed for information provided by physicians in contrast to other sources by respondents who were young, educated and women. The same population that is 'online'. Närhi (2007) also reported doctors as being among the most reliable source of information in every age group. There also seems to be a gender perspective regarding trust in health personnel. Hesse et al. (2005) found that women expressed trust in information provided by physicians. Aihara and Minai (2011a) also found that women were more likely to rely on health professionals for dietary information compared to men who were more likely to rely on their friends. Though in McKay, Houser, Blumberg, and Goldberg (2006) study, the female respondents reported relying on friends as nutrition information sources more often than males.

5.4.3.6 Nutritionists or dieticians

Not trusting in nutritionists or dieticians as sources of nutrition information was a significant predictor of the variance in the *CNL**influence*** construct. This probably means that by not trusting in nutritionists or dieticians as a source of information about nutrition, diet or food, a person's dietary habits may be easily influenced by other individuals or the media (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008). Therefore, they are more likely to trust information about nutrition, diet or food coming from various sources some of which may not be reputable and thus more likely to adopt negative dietary habits. McKay et al. (2006) recommend that food and nutrition professionals should take up more proactive roles in their communities by offering their services, such as writing or reviewing articles, columns, features about diet and nutrition in the local newspapers. Also, they can offer consultancy services for local television, radio news reports so as to ensure better quality and more accurate nutrition-related stories are presented to the public.

5.4.3.7 International organizations

Trust in international organizations such as the WHO as sources of nutrition information was a significant predictor of the variance in the *INL**discuss*** and *GrandNL* constructs. This probably means that individuals that trust in international organizations as sources of their nutrition information are probably more willing to discuss nutrition-related issues with other individuals such as family, friends and professionals (doctors, nurses, nutritionists and dieticians) and probably have a higher overall nutrition literacy. (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008). Spadaro (2003) results show that in the European Union medical/health organisations such as the Red Cross, and Médecins sans frontiers are the most trusted source of health information.

5.4.3.8 Government health agencies

Trust in government health agencies as a source of information about nutrition, diet or food, was a significant predictor of variance in the *INL* construct. This probably means that individuals who trust nutrition-related information from government health agencies probably have the cognitive abilities and interpersonal skills needed to manage nutrition issues in partnership with professionals (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008).

However, not trusting in government health agencies as a source of nutrition information was a significant predictor of the variance in the *CNL**influence*** construct. This probably means that by not trusting in government health agencies as a source of information about nutrition, diet or food, a person's dietary habits may be easily influenced by other individuals or the media (Nutbeam, 2000; Pettersen et al., 2009a; Silk et al., 2008). Therefore, they are more likely to trust information about nutrition, diet or food coming from various sources some of which may not be reputable and thus more likely to adopt negative dietary habits.

5.4.4 Media channels used to seek information about nutrition, diet or food

Almost three quarters of the adolescent students had ever searched for information about nutrition, diet or food. About a quarter of students had not recently searched for information about nutrition, diet or food from any source. However, the most used sources for information about nutrition, diet or food in descending order were: books, newspapers, health care provider, family and the internet. The least used sources for information were: library, brochures and pamphlets, radio and friends. The results of my master thesis study are quite different from Ybarra, Emenyonu, Nansera, Kiwanuka, and Bangsberg (2008) study that found that over 80% of adolescents in Mbarara district in Uganda turned to their parents, teachers and other adults for information about health, 56% used books/library, 50% used their siblings and friends and 38% used the internet. A probably reason for this difference could be due to the geographical characteristics of the study sites. Their study was done in Mbarara district a rural setting compared to my study site (Kampala district) which is a major urban setting.

Identifying the sources from which individuals seek nutrition information and the extent to which reliable sources are used are important in the promotion of healthy nutrition (Holgado et al., 2000). McKay et al. (2006) study revealed that both well and less educated individuals relied heavily on print media sources and that older adult's preferred their health information in written form. However, my results indicate that the majority of the adolescents prefer books and newspapers as sources for information about nutrition, diet or food. This probably implies that they have a high reading culture and more likely prefer print media material too. This can be utilised as an opportunity to inform and educate the adolescents about healthy nutrition habits by providing them with leaflets or monthly school based nutrition publications such as nutrition newsletters, with accurate easy to understand information about nutrition. These leaflets or

nutrition newsletters can be taken home by the adolescents and may also benefit their siblings and parents at home as they would probably be shared and also be kept for future reference by the adolescents. Another reason for using print material is that the content can be assessed and ensured that it is accurate and relevant. My recommendation for the use of leaflets or newsletters as sources for information about nutrition, diet or food is supported by Närhi (2007) findings that showed that patient information leaflets were among the most reliable sources of information in every age group.

5.5.5 Confidence in seeking nutrition-related advice or information

Ha and Lee (2011) results indicated that an individual's self-confidence in searching for health information significantly predicted his or her knowledge about cancer prevention and healthcare behaviour. Therefore, individuals that are highly confident in seeking health information are more likely to be knowledgeable about health and to be involved in healthy behaviours. However, my results showed that only a quarter of the adolescents were completely confident that when they needed nutrition-related advice or information they could get it. Though, on average the adolescents were only somewhat confident that when they needed nutrition-related advice or information they could get it. This implies that there is need for policy makers, nutrition educators and health professionals to help adolescents build their self-confidence in seeking nutrition-related information.

Ha and Lee (2011) study also found that self-confidence in seeking health information seems to be linked with an individual's health literacy and trust in information sources especially health professionals, family, friends and the internet. Hence, in order to help adolescents build their self-confidence in seeking nutrition-related information, health professionals, family, friends and online health information providers have to work together to ensure that adolescents have easy access to reliable, accurate and relevant nutrition related information. This will likely build trust between the adolescents and the various nutrition information sources and eventually increase their confidence in seeking nutrition related advise or information from the various sources when the need arises (Ha & Lee, 2011).

5.5.6 Level of trust in nutrition information sources

The majority of the adolescent students very strongly trusted in nutrition information that was from international organizations such as the WHO. They also very strongly trusted nutrition information that was from a nutritionist or dietician (55%), health personnel such as doctor or nurse (45%), government health agency (41%) and the internet (38%). The least trusted source of nutrition information that was from friends. There was a significant difference between the male and female adolescent students in trust in nutrition information from nutritionists or dieticians, the internet, television and radio with the male adolescent students having a higher mean value in all the four sources. These results are similar to Marquis, Dubeau, and Isabelle (2005) findings of a large percentage of respondents that were very confident about nutrition information from health professionals such as dieticians, physicians and nurses, the government and the internet.

With six out of ten and four out of ten adolescent students strongly trusting nutrition information that is from international organizations and government health agencies respectfully, and several studies suggesting that individual preferences can influence acquisition of health-related knowledge and health outcomes (Krantz, Baum, & Wideman, 1980; Mangan & Miller, 1983) and Miller (1987). International organizations and government health agencies should ensure that adolescents are aware and have access to their publications and online resources so as to ensure acquisition of accurate, relevant and up-to-date health and nutrition-related information among adolescents (Edejer, 2000; Godlee, Pakenham-Walsh, Ncayiyana, Cohen, & Packer, 2004). Half of the adolescent students mentioned trusting nutrition information from a nutritionist or dietician, this indicates that nutritionists and dieticians can play a significant role in influencing how adolescents get their nutrition information and thus eventually have an influence on their dietary habits. Also with more than one in three adolescent students trusting in health personnel, this only reaffirms the ‘traditional role’ of health personnel as gatekeepers in providing health care information and services to individuals (Hesse et al., 2005). By virtue of their knowledge, skills and training, health personnel have power and authority over patients due to the special status accorded to them. This power can and should be utilised to influence better health and nutrition behaviours and promote adherence to healthy living among adolescents (Schulman & Rienzo, 2001).

About a third of the adolescent students cited the internet as a source of nutrition information that they strongly trust. This result is similar to Ybarra et al. (2008) findings that indicated more than one in three adolescents in Mbarara district in Uganda used the internet to search for health information. This probably signifies that adolescents in Uganda are increasingly seeking health information for themselves. Adolescents view the internet as a powerful tool for healthcare information and have used the internet as an instrument of empowerment. The use of the internet as a source of health information has also led to some adolescents changing their behaviour and seeking health services (Ybarra & Suman, 2006). However, the use of the internet as a source of information may not necessarily imply that the traditional sources of health or nutrition information are being replaced, but rather the internet is being used to enhance and expand ones knowledge and understanding of a particular health or nutrition topic (Ybarra et al., 2008).

5.5.7 Barriers in seeking nutrition information

The barriers with the highest mean score and strongly agreed by most adolescent students as the major barriers to them seeking information about nutrition were: there being a lack of nutrition, diet or food information in other languages apart from English, also that nutrition information was difficult to understand. Another significant barrier cited by the adolescent students was that it is expensive seeking nutrition information, especially when one uses the internet. There was no significant difference between the male and female adolescent students regarding the barriers to seeking nutrition information, implying that they are both faced with similar barriers when they seek for information about nutrition.

Differences in language are a barrier to effective communication (Schyve, 2007). Language can also affect an individual's level of health and nutrition literacy (Boehl, 2007). The results of my study suggest that the adolescents prefer that information about nutrition, diet or food is also available in other languages apart from English. Uganda comprises of many ethnicities and broad linguistic groups[29]. Ethnic differences can contribute to communication breakdowns (Boehl, 2007). Most often students first learn their 'mother tongue' and later learn the English language when they begin schooling. Thus some adolescents may have Limited

[29] See link: http://www.africa.upenn.edu/NEH/u-ethn.html Accessed: 21st March 2012.

English Proficiency[30] (LEP) hence they may first translate the information from English into their 'mother tongue' so as to get a better understanding of it, however if the translation is poor this can led to misinterpretation of messages. If LEP is coupled with technical, jargon-rich medical terms found in most nutrition information sources, this would make the information more difficult to understand, a problem already cited by the adolescents in my study as also being a barrier to them seeking information about nutrition, diet or food (Singleton & Krause, 2010; Somnath & Fernandez, 2007). Therefore, information about nutrition, diet or food should be translated into other languages. However, this translation should be done by individuals that are competent in the selected languages, and also adolescents should be involved in the whole process so as to ensure that information that is relevant to them is translated.

Närhi (2007) study showed that there was a significant difference between age groups in reporting the internet as a source of medicine information with 15-34 year-olds reporting the greatest internet use. Also in Ybarra et al. (2008) study, one in three adolescents indicated that they had used the computer and internet to search for health information. And when asked what types of information they would search for if internet use was free, they reported that they would search for information on HIV/AIDS, alcohol, drug issues, depression and suicide. These results draw attention to the use of the internet as a source of information among adolescents. However, as earlier mentioned, another barrier cited by the adolescents in my study was that it was expensive seeking nutrition information, especially when one uses the internet as they have to pay in order to access computers with internet connection. Hence having seen the evidence of the internet being a significant source of information possibly even nutrition information among adolescents. I would suggest that adolescents be offered free access to internet at school so as to enable them search for health and nutrition-related information.

[30] Restricted ability to read, speak, write or understand English by individuals for whom English is not the primary language (Singleton & Krause, 2010).

6. Conclusion and implications

A total of seven nutrition literacy constructs were developed from the collected data after performing EFA: *FNL*, *INL*, *INL**discuss***, *CNL**action***, *CNL**media***, *CNL**influence*** and *GrandNL*. On average the adolescent students had moderate scores on the *FNL* and *INL* constructs. This probably implies that they most likely have the basic skills required to comprehend and follow nutrition messages. And also the interpersonal skills needed to manage nutrition issues in collaboration with other individuals, though they had a relatively high score on the *INL**discuss*** and *CNL**action*** constructs. There was also a significant difference in the mean scores for both constructs between the male and female adolescent students, with the females having the highest score in both constructs.

This suggests that female adolescents are more willing to discuss nutrition-related issues with other individuals such as family, friends and professionals (nutritionists, dieticians) and take action to improve nutritional aspects ranging from a personal level, national level up to an international level compared to their male counterparts. However, the adolescents had low scores for both the *CNL**media*** and *CNL**influence*** constructs. Hence the adolescent students are probably unlikely to evaluate nutritional claims made by media basing on sound scientific principles. This could imply that they are more likely to make poor nutrition related choices basing on the information obtained from the various media channels and that their dietary habits are easily influenced by other individuals and the media. Regarding the adolescent students overall average nutrition literacy as measured by the *GrandNL* construct (totality of functional, interactive and critical nutrition literacy), the adolescent students also had a moderate score.

The majority of the adolescent students preferred books and newspapers as sources for information about nutrition, diet or food. This probably implies that they have a high reading culture and more likely prefer print media material. Thus the use of leaflets or newsletters as sources for information about nutrition, diet or food can probably be a successful means of giving adolescents access to nutrition-related information. Although there is need for policy makers, nutrition educators and health professionals who were mentioned as being the most trusted sources of nutrition information to help adolescents build their self-confidence in seeking nutrition-related information as on average the adolescent students were only somewhat confident that when they needed nutrition-related advice or information they could get it.

The barriers with the highest mean score and strongly agreed by most adolescent students as the major barriers to them seeking information about nutrition were: there being a lack of nutrition, diet or food information in other languages apart from English, also that nutrition information was difficult to understand. Implying that there is a need among adolescents to have nutrition- related information translated into other languages, but it should also be done in such a way that that information can be easily understood.

6.1 Final reflection on the study

According to Pleasant and Kuruvilla (2008) health literacy can be divided into a public health approach and a clinical approach. A public health approach not only views health literacy as an important issue in both the public sphere and health-care settings. But it also connects health literacy with health promotion and social marketing of public health interventions. A clinical approach on the other hand, views health literacy as a problem that patients have and physicians need to solve it by better communicating their prescriptions to patients and help them better understand and comply with treatment regimens. Even though nutrition literacy can cut across both approaches, I suggest that a public health approach be undertaken to improve the nutrition literacy of adolescents in Uganda. One of the ways this can probably be achieved is by using the education system. Since schools are essential in achieving health literacy as they can equip students with skills and knowledge that not only have an impact on their health, but also help them be active participants in activities that shape polices in their communities. Also when the students reach maturity there can probably be generational transference of health literacy (Ratzan, 2001; St Leger, 2001). The same can be done in achieving nutrition literacy.

(Allensworth, 1993; Cameron & McBride, 1995; St Leger & Nutbeam, 2000; WHO, 1996) (as cited in St Leger, 2001) propose using the school in addressing health and social issues. This approach is called the '*health promoting school*' or '*co-ordinated school health*'. This approach can be used in nutrition in addressing four key areas:

Lifelong learning skills: schools can equip individuals with lifelong skills that can help with dietary changes that may need to occur due to life changes such as parenthood, when diagnosed with a disease. Also understanding and being able to contribute to public debate about nutrition-related topics such as genetically modified foods.

Competencies and behaviours: schools can equip students with competencies and behaviours such as being able to read food labels accurately, buying of food on a budget and preparation of a variety of foods.

Specific cognate knowledge and skills: schools can equip students with knowledge about the basics of nutrition and what constitutes a balanced diet.

Self attributes: schools can also equip individuals with skills that help them understand and cope with body changes that occur during puberty or adolescence and also use food as part of building social relationships.

All the four mentioned school-related health/nutrition/education outcomes above are dependent on students achieving each of Nutbeam (2000) three levels of health literacy, thus also achieving all the three levels of Pettersen et al. (2009a) hierarchical model of nutrition literacy (see Figure 6). However, even though an individual can survive on only one level of nutrition literacy, It is vital that they also achieve the top level (critical nutrition literacy) so as ensure greater autonomy and empowerment (St Leger, 2001).

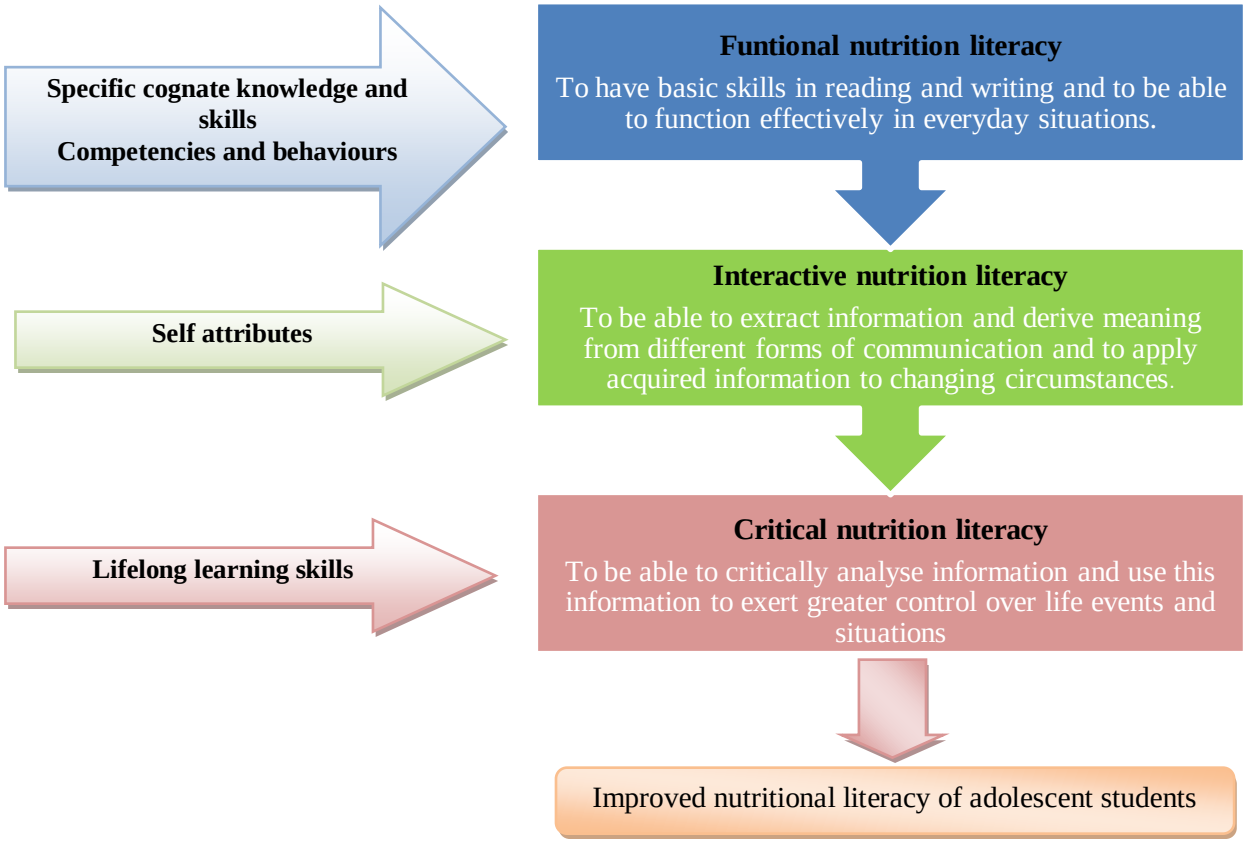

Figure 23. Conceptual model of the link between school education outcomes and nutrition literacy[31].

The 'health promoting school' or 'co-ordinated school health' approach can have an impact on nutrition literacy as adolescents undergo advances in cognitive abilities and develop improved capacity for processing information. Hence the adolescence period presents an opportune moment to introduce nutrition literacy interventions at an earlier age such that the knowledge and skills that are acquired will eventually have a direct impact on nutrition literacy later on in adulthood (Manganello, 2008).

6.2 Suggestions for further research

As earlier mentioned, health literacy is often measured in adults (Baker, Gazmararian, Sudano, & Patterson, 2000; Baker, Parker, Williams, Clark, & Nurss, 1997; Chew, Bradley, & Boyko, 2004; Davis et al., 2001; Morris, MacLean, Chew, & Littenberg, 2006; Morris,

[31] Model developed by author of thesis.

MacLean, & Littenberg, 2006; Paasche-Orlow, Parker, Gazmararian, Nielsen-Bohlman, & Rudd, 2005; Schillinger et al., 2002; Williams et al., 1998a; Williams et al., 1998b) and seldom in adolescents. This has been due to the lack of an agreed upon operational definition and adequate measurement tools with the few that exist measuring only reading ability or self-reported health literacy of adolescents (Chang, 2011; Davis et al., 2006; Manganello, 2008; Norman & Skinner, 2006; Wu et al., 2010). Also nutrition literacy studies among adolescents are still limited as most of the studies are about nutritional knowledge (Johnson, Wardle, & Griffith, 2002; Kapil, Bhasin, & Manocha, 1991; Peltzer, 2002; Shaaban, Nassar, Abd Elhamid, El-Batrawy, & Lasheen, 2009; Thakur & D'Amico, 1999; Turconi et al., 2003) and most have limitations in one or more areas such as a lack of psychometric validation or cover only a limited area of nutrition knowledge (Parmenter & Wardle, 1999). Therefore, I suggest that the study tool of my study be modified and developed further into a questionnaire that can be used to assess nutritional literacy of adolescents not only in a Ugandan context but also internationally (Begoray & Kwan, 2012; Jordan, Osborne, & Buchbinder, 2011; Parmenter & Wardle, 2000).

Further research should be done in identifying the major online sources used by adolescents when seeking for nutrition-related information, their interpretation of the information as well as the accuracy of the information they access. Also further research should be done in identifying the possible demographic variables that significantly influence the nutrition literacy of adolescents. It is hoped that answers to these studies can help progress the efforts of nutrition and health promotion and education among adolescents.

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Appendix A. Thesis plan and scheduling

The Gantt-chart below highlights the activities that where involved when conducting the study and the time frame within which they were conducted.

Table 25. Thesis plan and scheduling.

Activities	Months (June 2011- June 2012)												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Thesis proposal approval by research committee at Oslo and Akershus University College of Applied Sciences													
Research clearance from UNCST & MOE													
Planning, development, standardization & piloting of study tools													
Scheduling of appointments with the study sites													
Data collection													
Data analysis													
Thesis write-up													
Review of draft report by supervisors													
Final thesis report write up & thesis defense													
Travel back home, & dissemination of study results to the relevant authorities and research collaborators													

Appendix B. Study budget

The financial resources that were used to conduct the study were part of the student loan from the Norwegian State Educational Loan Fund (Lånekassen) through Oslo and Akershus University College of Applied Sciences, Lillestrøm, Norway. Table 26 shows the budget of the study.

Table 26. Thesis budget.

Item	Total required	Unit measure	Unit cost (UGX)	Total cost (UGX)	Total cost (NOK)
Research materials (printing of questionnaires & stationery)	**-**	**-**	**-**	**650,000**	**1548**
Allowance for research assistant	**30 days**	**Per day**	**10,000**	**300,000**	**714**
Communication expenses	**50 hours**	**Per hour**	**5000**	**250,000**	**595**
Transportation expenses	**30 days**	**Per day**	**10,000**	**300,000**	**714**
Miscellaneous	**-**	**-**	**-**	**500,000**	**1190**
Total expenditure				**2,000,000**	**4761**

Note. 1 Norwegian Krone = 420 Ugandan Shillings as of June 20, 2011. UGX = Ugandan Shillings, NOK = Norwegian Kroner.

Appendix C. Questionnaire

Introduction and Consent

My name is Ndahura Nicholas Bari, a student at Oslo and Akershus University College of Applied Sciences, Lillestrøm, Norway. Pursuing a Master's degree in Food, Nutrition and Health. I am conducting my master thesis titled ***Nutrition literacy status of adolescent students in Kampala district, Uganda***. Nutrition literacy can be defined as the degree to which people have the capacity to obtain process and understand basic nutrition information. It is hoped that the results of this study will provide a foundation for further exploration in nutrition literacy within the context of adolescent nutrition and help discover better ways of communicating accurate nutrition related information to adolescents.

Formal consent of respondents is required in accordance to ethical guidelines that underlie academic research involving human respondents. I therefore humbly request you to kindly participate in the above mentioned study. This study is solely for academic purposes and all of your answers will be kept confidential. Your participation is voluntary and you may refuse to take part in this study or withdraw from the study at any time. However, your answers and opinions are very important to the success of this study, as you represent others who may share your knowledge and beliefs. I would highly appreciate your participation in this study. It is estimated that the questionnaire will take 10-15 minutes to complete. In case you would like to know anything about the study/ research before we proceed, please ask.

Do you agree to participate in this study?

- ☐ Yes
- ☐ No

Date……

(Please tick the appropriate box)

1. **Class**

O' level

- ☐ Senior 1
- ☐ Senior 2
- ☐ Senior 3
- ☐ Senior 4

2. **Age:**……

3. **Sex:**

- ☐ Male
- ☐ Female

Instructions: Please carefully read each statement and indicate by a tick in the box if you either strongly disagree/disagree/ neither agree or disagree/agree or strongly agree with each of the statements.

Please remember to mark only one box for each statement unless otherwise stated.

There is no right or wrong answer.

4. **Functional nutrition literacy**

Statements	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree
4.1. I find that the language used by nutrition, health and food experts difficult to understand.	❑	❑	❑	❑	❑
4.2. I find it difficult to understand the jargon (words) used by nutrition, health and food experts.	❑	❑	❑	❑	❑
4.3. When I read information about nutrition, food or diet I find it difficult to understand.	❑	❑	❑	❑	❑
4.4. I find it difficult to know how I should change my diet when I get dietary advice from the doctor, nurse or the like.	❑	❑	❑	❑	❑
4.5. When I read information about nutrition, food or diet I need someone to help me understand it.	❑	❑	❑	❑	❑
4.6. I am not familiar with World Health Organisation (WHO) recommendation for daily intake of fruits and vegetables.	❑	❑	❑	❑	❑
4.7. I am familiar with the food pyramid.	❑	❑	❑	❑	❑
4.8. When I read an article about nutrition, food or diet I find words that I don't know.	❑	❑	❑	❑	❑
4.9. I am familiar with the concept of a 'balanced diet'.	❑	❑	❑	❑	❑

5. **Interactive nutrition literacy**

Statements	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree
5.1. I have gathered information about diet from various sources that I think is relevant for me.	❑	❑	❑	❑	❑
5.2. I use the internet when I am looking for information about nutrition such as diet.	❑	❑	❑	❑	❑
5. 3. I discuss about diet with my friends, family and relatives.	❑	❑	❑	❑	❑
5.4. I have changed my eating habits based on the information about diet that I have gathered.	❑	❑	❑	❑	❑
5.5. I don't follow public debate about diet for example on Television, Radio.	❑	❑	❑	❑	❑
5.6. I often read material about what constitutes a balanced diet.	❑	❑	❑	❑	❑
5.7. I readily take the initiative to discuss with dietary experts (for example a doctor, nurse or the like) about healthy eating.	❑	❑	❑	❑	❑
5. 8. When I want information about diet I do not know which departments within the health service that I can go to for help.	❑	❑	❑	❑	❑
5.9. I have discussed my thoughts about diet to someone else (for example my friends, family, relatives, a doctor, nurse or the like).	❑	❑	❑	❑	❑

6. **Critical nutrition literacy**

Statements	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree
6.1. I would readily get involved in political issues targeted at improving people's diet in Uganda.	❑	❑	❑	❑	❑
6.2. I am willing to take an active role in measures aimed at promoting a healthier diet at my school.	❑	❑	❑	❑	❑
6.3. I expect my school to serve healthy food.	❑	❑	❑	❑	❑
6.4. I try to influence others (for example my family and friends) to eat healthy food.	❑	❑	❑	❑	❑
6.5. It is important for me that the school canteens have a good selection of healthy food.	❑	❑	❑	❑	❑
6.6. I tend to be influenced by the dietary advice I read in newspapers, magazines etc	❑	❑	❑	❑	❑
6.7. I tend to be influenced by the dietary advice I get from my family, friends.	❑	❑	❑	❑	❑
6.8. I trust the various diets that I read in newspapers, magazines, etc.	❑	❑	❑	❑	❑
6.9. I believe that the media's presentation of scientific findings about nutrition, diet, food is correct.	❑	❑	❑	❑	❑
6.10. I find it difficult to distinguish scientific information from non-scientific information about diet.	❑	❑	❑	❑	❑

Statements	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree
6.11. When I read information about nutrition, diet or food it is important to me that it is based on scientific evidence.	❑	❑	❑	❑	❑

7. Have you ever looked for information about nutrition, diet or food from any source?

□ Yes □ No (*if No, Go to questions 10,11 & 12*)

8. The most recent time you searched for information about nutrition, diet or food, where did you go first? (Mark only one).

□ Books
□ Brochures, pamphlets, etc.
□ Family
□ Friend/classmate
□ Doctor or healthcare provider
□ Internet
□ Library
□ Magazines
□ Newspapers
□ Complementary, alternative, or unconventional practitioner
□ Television
□ Radio
□ Other (*specify*)…….

9. Did you look or search or go anywhere else? **(Mark all that apply)**

□ Books
□ Brochures, pamphlets, etc.
□ Family
□ Friend/classmate
□ Doctor or healthcare provider
□ Internet
□ Library
□ Magazines
□ Newspapers
□ Complementary, alternative, or unconventional practitioner
□ Television
□ Radio
□ Other (*specify*)……

10. How confident are you that you could get nutrition-related advice or information if you needed it? (Mark only one).

	Completely confident	Very confident	Somewhat confident	A little confident	Not confident at all
How confident are you?	❑	❑	❑	❑	❑

11. How much do you agree or disagree with each of the following statements as barriers to seeking information about nutrition, diet or food?

Barriers to seeking nutrition information	Strongly Agree	Agree	Neither agree or disagree	disagree	Strongly disagree
11.1. It's a lot of effort to get the information.	❑	❑	❑	❑	❑
11.2. It is difficult to verify the credibility of the information.	❑	❑	❑	❑	❑
11.3. The information is difficult to understand.	❑	❑	❑	❑	❑
11.4. There is a lack of nutrition, diet or food information in other languages apart from English.	❑	❑	❑	❑	❑
11.5. It takes a lot of time to seek for the information.	❑	❑	❑	❑	❑
11.6. Any other (please, specify).					

12. In general, how much would you ***trust*** information about nutrition, diet or food ***coming*** from each of the following sources?

Trust in nutrition information sources	Very weakly	Weakly	Neutral	Strongly	Very Strongly
12.1. A doctor, nurse or any other health personnel	❑	❑	❑	❑	❑
12.2. A nutritionist or dietician	❑	❑	❑	❑	❑
12.3. Family	❑	❑	❑	❑	❑
12.4. Friends	❑	❑	❑	❑	❑
12.5. Text books	❑	❑	❑	❑	❑
12.6. Newspapers or magazines	❑	❑	❑	❑	❑
12.7. The internet	❑	❑	❑	❑	❑
12.8. Television	❑	❑	❑	❑	❑
12.10. Radio	❑	❑	❑	❑	❑

12.11. Government health agencies	❑	❑	❑	❑	❑
12.12. International organisations such as the World Health Organisation (WHO)	❑	❑	❑	❑	❑

The End

Thank you for participating in this study

Appendix D. Letter from the Norwegian Social Science Data Services

Norsk samfunnsvitenskapelig datatjeneste AS
NORWEGIAN SOCIAL SCIENCE DATA SERVICES

Harald Hårfagres gate 29
N-5007 Bergen
Norway
Tel: +47-55 58 21 17
Fax: +47-55 58 96 50
nsd@nsd.uib.no
www.nsd.uib.no
Org.nr. 985 321 884

Kjell Sverre Pettersen
Avdeling for helse, ernæring og ledelse
Høgskolen i Akershus
Postboks 423
2001 LILLESTRØM

Vår dato: 03.06.2011 Vår ref:27199 / 3 / LMR Deres dato: Deres ref:

TILBAKEMELDING PÅ MELDING OM BEHANDLING AV PERSONOPPLYSNINGER

Vi viser til melding om behandling av personopplysninger, mottatt 10.05.2011. Meldingen gjelder prosjektet:

27199	*Nutrition Literacy Status of Adolescent Students in Central Division-Kampala District, Uganda*
Behandlingsansvarlig	*Høgskolen i Akershus, ved institusjonens øverste leder*
Daglig ansvarlig	*Kjell Sverre Pettersen*
Student	*Ndahura Nicholas Bari*

Etter gjennomgang av opplysninger gitt i meldeskjemaet og øvrig dokumentasjon, finner vi at prosjektet ikke medfører meldeplikt eller konsesjonsplikt etter personopplysningslovens §§ 31 og 33.

Dersom prosjektopplegget endres i forhold til de opplysninger som ligger til grunn for vår vurdering, skal prosjektet meldes på nytt. Endringsmeldinger gis via et eget skjema, http://www.nsd.uib.no/personvern/forsk_stud/skjema.html.

Vedlagt følger vår begrunnelse for hvorfor prosjektet ikke er meldepliktig.

Vennlig hilsen

Bjørn Henrichsen Linn-Merethe Rød

Kontaktperson:Linn-Merethe Rød tlf: 55 58 89 11
Vedlegg: Prosjektvurdering
Kopi: Ndahura Nicholas Bari, Åråssvingen 11, room number 408, 2007 KJELLER

Avdelingskontorer / *District Offices:*
OSLO: NSD. Universitetet i Oslo, Postboks 1055 Blindern, 0316 Oslo. Tel: +47-22 85 52 11. nsd@uio.no
TRONDHEIM: NSD. Norges teknisk-naturvitenskapelige universitet, 7491 Trondheim. Tel: +47-73 59 19 07 kyrre.svarva@svt.ntnu.no
TROMSØ: NSD. SVF, Universitetet i Tromsø, 9037 Tromsø. Tel: +47-77 64 43 36. nsdmaa@sv.uit.no

Appendix E. Letter from the Uganda National Council for Science and Technology

Uganda National Council for Science and Technology

(Established by Act of Parliament of the Republic of Uganda)

Our Ref: SS 2577 **July 7, 2011**

Mr. Nicholas Bari Ndahura
Kyambogo University
P.O Box 1
KYAMBOGO

Dear Mr. Ndahura,

RE: RESEARCH PROJECT, "NUTRITION LITERACY STATUS OF ADOLESCENT STUDENTS IN CENTRAL DIVISION-KAMPALA DISTRICT, UGANDA"

This is to inform you that the Uganda National Council for Science and Technology (UNCST) approved the above research proposal on **June 29, 2011.** The approval will expire on **June 29, 2012.** If it is necessary to continue with the research beyond the expiry date, a request for continuation should be made in writing to the Executive Secretary, UNCST.

Any problems of a serious nature related to the execution of your research project should be brought to the attention of the UNCST, and any changes to the research protocol should not be implemented without UNCST's approval except when necessary to eliminate apparent immediate hazards to the research participant(s).

This letter also serves as proof of UNCST approval and as a reminder for you to submit to UNCST timely progress reports and a final report on completion of the research project.

Yours sincerely,

Jane Nabbuto
for: Executive Secretary
UGANDA NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

LOCATION/CORRESPONDENCE

Plot 6 Kimera Road, Ntinda
P. O. Box 6884
KAMPALA, UGANDA

COMMUNICATION

TEL: (256) 414 705500
FAX: (256) 414-234579
EMAIL: info@uncst.go.ug
WEBSITE: http://www.uncst.go.ug

Appendix F. Letter from the Ministry of Education and Sports, Uganda

Telegram: "EDUCATION"
Telephone: 234451/8
Fax: 234920
Kampala, Uganda

THE REPUBLIC OF UGANDA

Ministry of Education and Sports
Embassy House
P.O. Box 7063

In any correspondence on
This subject please quote ADM/83/304/01

3rd August 2011

To All Headteachers
Government Aided Secondary Schools and Private Secondary Schools in
Kampala District

RE: MR. NDAHURA NICHOLAS BARI

This is to introduce to you Mr. Ndahura Nicholas Bari a student pursing a Master's Degree in Food, Nutrition and Health in Akershus University College, Norway. He is doing a Master's Thesis on ***'Nutrition literacy status of adolescent students.'*** A case study of Kampala District.'

The study is intended to provide a foundation for further exploration in nutrition information.

Any assistance rendered to him will be highly appreciated.

F. Uma Agula
For: PERMANENT SECRETARY

Appendix G. Letter from the Office of the President of the Republic of Uganda

THE REPUBLIC OF UGANDA

OFFICE OF THE PRESIDENT

PARLIAMENT BUILDING P.O.BOX 7168 KAMPALA, TELEPHONES: 254881/6, / 343934, 343926, 343943, 233717, 344026, 230048, FAX: 235459/256143
Email: secretary@op.go.ug, Website: www.officeofthepresident.go.ug

ADM 154/212/01

August 3, 2011

The Resident District Commissioner
Kampala District

This is to introduce to you **Mr. Ndahura Nicholas Bari** a Researcher who will be carrying out a research entitled **"Nutrition literacy status of adolescent students in Central Division-Kampala District"** for a period of **01 (one) year** in your district.

He has undergone the necessary clearance to carry out the said project.

Please render him the necessary assistance.

By copy of this letter **Mr. Ndahura Nicholas Bari** is requested to report to the Resident District Commissioners of the above districts before proceeding with the Research.

Alenga Rose
FOR: SECRETARY, OFFICE OF THE PRESIDENT

Copy to: **Mr. Ndahura Nicholas Bari**

Appendix H. List of secondary schools in Kampala district obtained from the Ministry of Education and Sports, Uganda

Kampala	Kampala City	Central Kampala	Kololo I	City H.S.
Kampala	Kampala City	Central Kampala	Kololo I	Kololo S.S.S
Kampala	Kampala City	Central Kampala	Kololo II	Kololo H.S.
Kampala	Kampala City	Central Kampala	Kololo III	Kitante Hill S.S.
Kampala	Kampala City	Central Kampala	Old Kampala	Kampala H.S.
Kampala	Kampala City	Central Kampala	Old Kampala	Old Kampala S.S.S.
Kampala	Kawempe	Kawempe North	Kawempe II	Kawempe Muslim S.S.
Kampala	Kawempe	Makerere University	Muluka I	Makerere College School
Kampala	Makindye	Makindye East	Ggaba	St. Denis S.S Ggaba
Kampala	Makindye	Makindye East	Kibuli	Kibuli S.S.S
Kampala	Makindye	Makindye West	Nsambya Central	St.Peter's Nsambya S.S.
Kampala	Nakawa	Nakawa	Bukoto II	Kalinabiri S.S.
Kampala	Nakawa	Nakawa	Kyambogo	Nabisunsa Girls School
Kampala	Nakawa	Nakawa	Kyambogo	Kyambogo College School
Kampala	Nakawa	Nakawa	Luzira	Luzira S.S.
Kampala	Rubaga	Rubaga North	Namirembe	Mengo S.S
Kampala	Rubaga	Rubaga South	Mutundwe	Kitebi S.S.
Kampala	Rubaga	Rubaga South	Nateete	Natete Muslim H.S.
Kampala	Rubaga	Rubaga South	Nateete	Mackay College School
Kampala	Rubaga	Rubaga South	Rubaga	Lubiri S.S.S.