

CHAPTER 3

Research project: The learning website

3.1 Introduction

This chapter describes the design, development, implementation and evaluation of one of the contributory tutorial components of the nutrition and HIV and AIDS course, which forms part of the distance education Social Behavioural Studies in HIV and AIDS Programme at VUDEC. The component comprises a specific training medium, namely a study guide in the format of a website that can be accessed through the Internet or CD-Rom. This is the first time that such a format had been used as part of the course material for the Social Behavioural Studies in HIV and AIDS Programme. In fact, this is the first time that a combination of media and technologies had been used to present any part of any of the distance education programmes at Vista University. The other components of the course had already been designed and developed. The evaluation of these components as part of a combination of media and technology of the nutrition and HIV and AIDS course is discussed later in this chapter.

The goal of chapter three is to report on the investigation of the design and instructional aspects of the learning website as a means of delivering a basic knowledge of nutrition and nutritional care and support for PLWHA to adults with limited nutrition knowledge, from previously disadvantaged communities. The study was undertaken in response to an urgent need to conduct research into how to provide adult learners with first-degree qualifications in fields other than nutrition, a basic knowledge of nutrition and nutritional care and support for PLWHA. It was earlier mentioned that the learners who enrol for this course have very little or no knowledge about nutrition. Because what they *do* believe about nutrition is often wrong (and even dangerous), they urgently need correct scientific information. Because the Social Behavioural Studies in HIV and AIDS Programme does not offer a course on **basic** nutrition, learners must acquire this knowledge on their own before they can embark on the section about the nutritional care and support for PLWHA. The website therefore fulfils the following functions:

- It educates learners in the basic concepts of human nutrition and therefore brings them all up to the same level of knowledge about basic nutrition.
- It develops critical skills, methods and modes of communication.
- It provides instant access to learning content after registration. This eliminates the problems that occur because learners receive their printed materials late, or only some of the materials, or the incorrect materials, or because printed material go astray in the post.
- It provides an *alternative* medium of offering content about nutrition and HIV and AIDS.

Traditionally, study materials at Vista University have only been offered in a printed format. Such materials usually include a study guide with activities, readings, assignments and a tutorial letter. Learners are expected to work through the readings, study guide and the accompanying activities before they embark on the assignments. The activities serve as a means for learners to test their grasp of the content. The assignments are then completed and submitted for evaluation and feedback which is provided by the facilitator.

Learner's assignments are usually completed on paper and sent by post. The feedback on these assignments is posted back to the learners. This process takes approximately six or more weeks to complete. The programme is outcomes-based and learners can therefore redo the assignments to improve their marks, if they so wish. When a learner decides to redo an assignment, that process will take another six to eight weeks to complete. The long turn-around time for each assignment makes it very difficult for learners to resubmit assignments on time. The intervals are so long that learners tend to lose interest in a particular assignment because they have other courses and assignments to attend to. In general, learners who do not work through the activities and submit only one attempt at an assignment, fail. Learners who fail two or more courses often discontinue the failed courses and enrol for other courses. This extends the length of their study programme and further distances their potential graduation date – or else they drop out completely.

Printed study material (in the form in which it is currently widely used) cannot (because of its very structure and format) provide all the content and information that the learner may need. The printed format is also not the ideal means to develop learner's problem solving skills or to tutor them on presentation and academic writing skills.

During 2001 to 2003 I obtained learner and facilitator feedback in both formal and informal interviews, and used programme evaluation forms to determine (1) the limitations and deficiencies of traditional study material and (2) the problems that learners experienced with the course. I took notes during the interviews and collected data from the evaluation forms.

From analysing learner and facilitator feedback, I came to the following conclusions:

- Learners experienced subject matter as being new and unfamiliar.
- They have difficulty in expressing themselves adequately and correctly in writing.
- They have difficulty in applying the newly acquired knowledge to real-life situations.
- They need to use different methods and formats wherewith to practice their skills.
- They need more face-to-face contact with facilitators.
- They receive their study materials late, or they get lost in the post.
- They need *immediate* feedback after they have completed their assignments.
- A learner feels completely alone when he or she is the only person in the area enrolled for a course.
- They have difficulty in accessing resources such as libraries and do not have the skills to find information on certain topics.

The training website can, in contrast, provide the following benefits:

- immediate access to study material
- alternative format of offering content
- access to additional resources and information not covered in the paper-based study guide
- interactivity (i.e. learners do exercises and receive immediate feedback)
- additional activities in different formats
- alternative training methods to accommodate various learning styles
- communication and collaboration between learners (and learners and facilitators)
- an improvement on the black-and-white paper format of delivering content

Designing online course materials entails, among other activities, the integration of constructivist theoretical assumptions, instructional applications, and those features that are unique to the web – such as embedded hyperlinks, enhanced media, and synchronous and asynchronous communication capabilities which help learners to construct representations of knowledge (Miller & Miller, 2000:163).

Figure 3.1 offers a schematic representation of a model on how an individual construct knowledge.

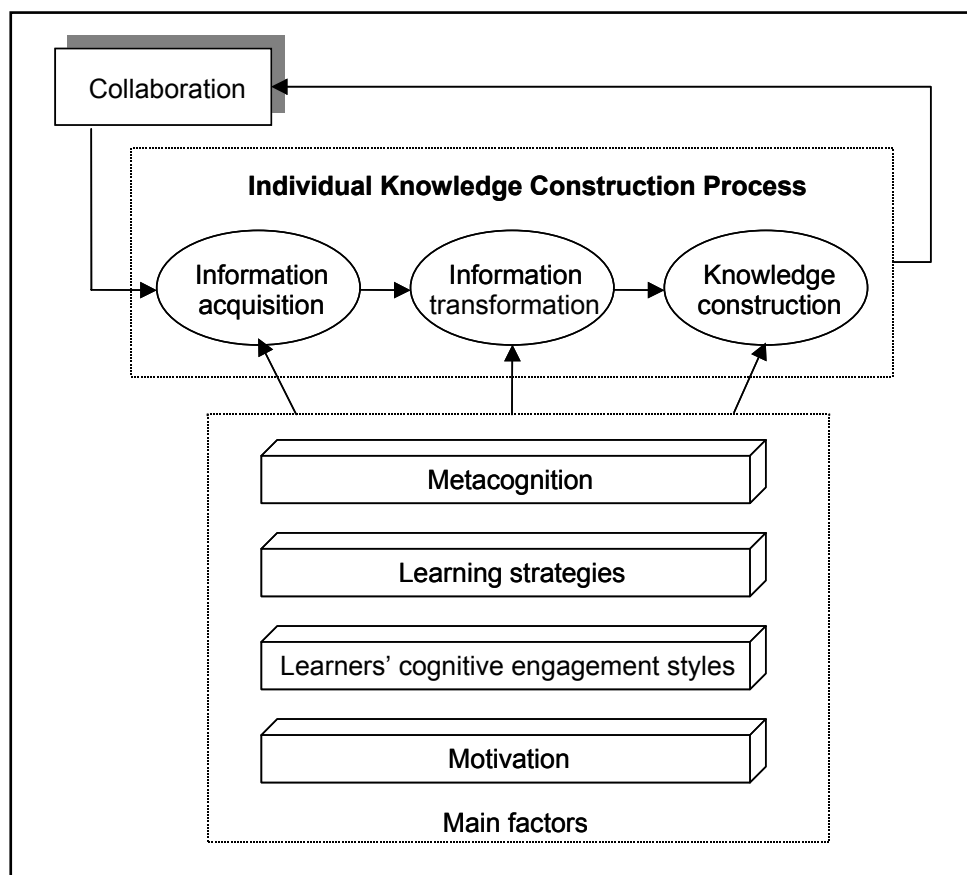


Figure 3.1: Individual knowledge construction model (Kang & Byun, 2001:50)

The effectiveness of a hypermedium such as the www as a learning tool depends on “the accessibility of the given hypermedium as the source of information and the willingness and ability of the user to use the information in an efficient manner based upon his/her prior knowledge and learning skills” (Fisher & Mandl 1989:xix, in El-Tigi & Branch, 1997:24). When learners are exposed to “real world” situations, they construct their individual knowledge as they distil whatever meanings might be present for them in their experiences. The learning experience should therefore include presentations of real-world situations in a context that facilitates collaboration (Wilson, et al., 1993:[Online]; Jonassen, 1999:216). The website should therefore aim to expose learners to situations that are similar as possible to those that prevail in the real world as they learn how to apply the information they have gained concerning sound nutrition principles to their own life situations.

The aim of this study is not to measure (by means of pre-tests and post-tests) whether or not learning took place. It does not attempt to refute Clark’s (1994:27) arguments that there is no evidence that media or unique media characteristics influence learning, or Russell’s (1999:[Online]) findings that no particular delivery medium made any significant difference to learner performance. The purpose of this study is to (1) produce an effective interdisciplinary postgraduate distance education course in nutrition and HIV and AIDS aimed at adult learners from previously disadvantaged communities with limited nutrition knowledge and (2) determine to what extent e-learning can be used to address the limited nutrition knowledge of learners and to communicate knowledge about nutrition and HIV and AIDS while encouraging self-directed exploration knowledge formation.

I evaluated learner responses to the offering of course content by means of a website. The advantages and limitations of the website – as experienced by the learners – are described and analysed. If learner responses (as evidence by the evaluation) are clearly positive, I would have made a strong case for the introduction of a learning website as part of the distance education course material for learners studying nutrition and HIV and AIDS.

This chapter comprises a description of the instructional design process covering the needs analysis, and the design, development and implementation of the learning website. This is followed by a description of the research methods that I used to conduct the research, the relevant research questions, those elements of the questions that are addressed by the website, and the means that I used to investigate each question.

The design of the website commenced in 2002. The development, implementation and evaluation of the website took place during 2002 and 2003.

3.2 Instructional design process

The ADDIE (**A**nalysis, **D**esign, **D**evelopment, **I**mplementation and **E**valuation) (Lee & Owens, 2000:137) instructional systems design model was followed as guideline during the development phase of the learning website in nutrition and HIV and AIDS. The following phases were addressed:

- Assessment/Analysis phase
 - Needs assessment
 - Goal analysis
 - Target population analysis
 - Task analysis
 - Content analysis
 - Instructional strategy analysis
 - Media analysis
 - Situation analysis
- Design phase
- Development phase
- Implementation phase
- Evaluation phase
 - Formative evaluation
 - Summative evaluation

Figure 3.2 on the next page models the interconnection between the needs assessment, program development and evaluation. The close placing of the beginning of the needs assessment and the end point of the evaluation illustrates the likelihood that the ending of one cycle of needs assessment, program development and evaluation will most probably be followed by another cycle, if the program is intended to maintain its viability (Eastmond, 1994:89).

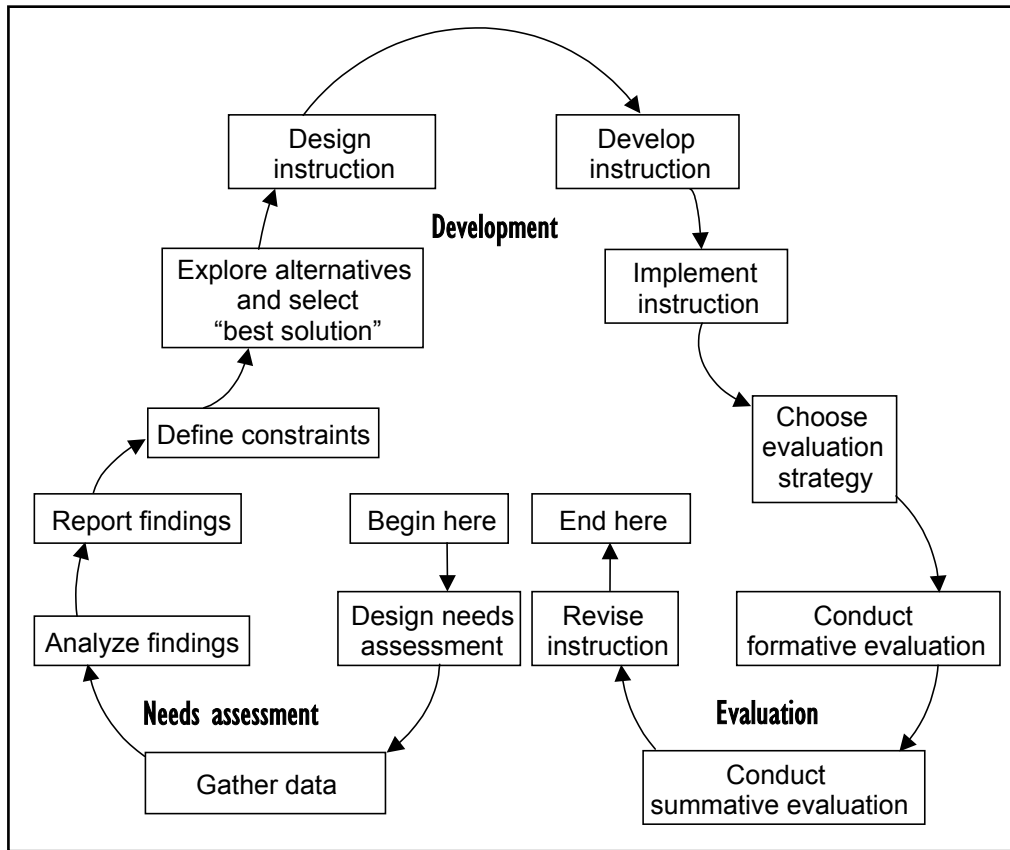


Figure 3.2: Step-by-step formulation of instruction (Eastmond, 1994:90)

I viewed the constructivist paradigm as most suited for implementing technology as tool to support learning. As evidence continues to confirm the efficacy of what the constructivist paradigm has to offer when using educational technology to maximise learning benefits, educators will more and more be obliged to consider this paradigm when developing and designing educational courseware (Willis, 2000:6; Tan & Hung, 2002).

3.2.1 Assessment/Analysis phase

□ Needs analysis assessment

To conduct a needs analysis in the case of distance education, implies determining the gap between “what is” and “what should be” defined at the level of the learners enrolled for a distance education course (Eastmond, 1994:90). During the needs analysis phase, I covered the seven types of front-end analysis listed and described in Table 3.1 on the next page. The seven types are goal analysis, target population analysis, task analysis, content analysis, instructional strategy analysis, media analysis and situation analysis.

Table 3.1: The seven types of front-end analysis covered in this study (adapted from Lee & Owens, 2000:14)

Type	Purpose
Goal analysis	Identify the goals of the learning event.
Target population analysis	Identify learner background.
Task analysis	Describe the task they have to perform.
Content analysis	Determine the content of the website.
Instructional strategy analysis	Determine how learners are going to achieve the performance objectives.
Media analysis	Identify the appropriate media delivery strategy.
Situation analysis	Identify environmental or organisational constraints that may have an impact on the goals.

Each of the seven front-end analyses listed in Table 3.1 will be discussed in the sections below.

□ Goal analysis

Setting goals for a learning website provides a framework for what learners are suppose to be able to do after completing the learning events and for knowing what they have to do to accomplish the goal (Mager, 1991:44; Jolliffe et al., 2001:59).

The goal for the Social Behavioural Studies in HIV and AIDS programme was identified as:

The delivery of a comprehensive social behaviour intervention programme to reduce the socio-economic impact of HIV and AIDS in Southern Africa.

The goal for the nutrition and HIV and AIDS course was identified as:

To familiarise the learner with the need for public nutrition and social health care promotion in HIV/AIDS in Southern Africa.

Because these goals had been formulated for printed content, the goals of the website had to be reformulated to answer the following question:

Why should a combination of media and technology be implemented in the training of learners in the field of behavioural studies and HIV and AIDS?

From the literature review (chapter 2), learner comments, and contributions from the management committee of the HIV and AIDS learning programme, the following questions were devised to formulate more specific goals:

- Why should a programme using a combination of media and technology be developed?
- What does the programme provide learners with?
- Are learners going to use the various media and technology offered by the programme?
- When must they use the media provided by the programme?
- Where will the media be used?

After resolving these questions, the goal could be formulated as follows:

To develop a solution-driven, skills-developing training programme for adult learners in Social Behaviour Studies and HIV and AIDS, by means of a combination of media and technologies which is at their disposal anywhere and at any time.

The following goal was then formulated for the website:

To develop an instructionally sound training website that supports the programme goals by functioning as a tool to strengthen the impact of the printed course material, and that forms an integral part of a delivery mode that combines media and technology.

The printed material was developed by implementing outcomes-based principles in the context of a constructivist paradigm. Learners are expected to identify principles and concepts and then apply them to real world situations by completing certain activities and assignments. The role of the learning website was to provide additional content and practical exercises that gave learners opportunities to apply whatever concepts and knowledge they had acquired. The exercises and assignments could be completed individually or in groups of two or three learners, at home, or during contact sessions. The next section will look at the target population analysis.

❑ Target population analysis

Learners enrolled for the Social Behaviour Studies and HIV and AIDS Programme come from diverse backgrounds and circumstances. This should be taken into account when developing a learning website. Other factors that should also be taken into consideration when developing a programme are their demographic profiles, their language, their professional and educational backgrounds, their experience of and attitude towards distance training, their study methods and degree of access to technology.

Although the Social Behaviour Studies and HIV and AIDS Programme has been offered since 2001, no learner profile has as yet been compiled. Because learner profiles are important when deciding on which instructional methods, learning approaches, techniques and media are the most appropriate for achieving the best outcomes, I collected data and compiled learner profiles. I collected information by means of a questionnaire (See Appendix B, questionnaire A: Learner profile). This questionnaire was adapted from the questionnaires developed by Beneke (1999) and Cloete (2001) to accommodate learners in Social Behaviour Studies and HIV and AIDS at Vista University.

Only a selection of the resultant personal and demographic information of learners enrolled for the programme in 2002 and 2003 that is relevant to this study is summarised in the table on the next page. Due to limited staff resources only 60 new learners are allowed to enrol for the programme each year. Most of the learners complete the programme over a period of two years. Data from 43 and 64 learners who attended the contact sessions for the first time in 2002 and 2003 were collected respectively. The data significant for this study (including number of learners, sex, age, home language, province in which learner resides, and marital status) is summarised in Table 3.2 on the next page.

From Table 3.2 on the next page, it can be seen that most of the learners enrolled for the Social Behavioural Studies in HIV and AIDS Programme are female and that the learners are older and more mature. A possible reason for the higher female enrolment could be that the programme comprises of social issues concerning HIV and AIDS and that women are usually more involved in the community and concerned with the caring for the ill. Another reason could also be that due to personal and socio-economic factors many women need to improve the qualifications to be competitive in the marketplace.

The differences in the age bracket percentages between the two year groups could be due to a larger group of younger learners that enrolled for the degree programme in 2003. A number of these learners have completed their degrees a year or two ago and had not been able to find employment. In discussions with them they said they viewed this degree as an opportunity to increase their marketability. It differences could also be due to the fact that the degree programme for 2003 was better marketed and that the learners that enrolled for the degree on 2002 also spread the word. We also were able to allow more learners to enrol for the programme in 2003.

In the next section the task analysis will be discussed.

Table 3.2: Personal and demographic information of learners

		2002	2003	
Number of learners		43	64	There was a 48,8 percent increase in the number of learners from 2002 to 2003. If such increases continue, the demand for other forms of content delivery will increase because of the larger number of learners and staff constraints.
Characteristics		Percentage		Significance
Sex	Male	26,8	29,7	A huge majority of learners are female. Methods of approaching the programme should take into account the fact that most of the learners are female.
	Female	73,2	70,3	
Age	24 and under	6,7	11,1	There was an interesting difference between the two groups. In 2002, the majority of learners were in the age group 35-39, while in 2003 the majority were older and fell in the age group 40-44. There were increased enrolments in all the age groups except for the 35-39 group, which decreased notably. The majority of learners who enrolled for this programme are older, more mature learners.
	25-29	10,0	14,8	
	30-34	20,0	11,1	
	35-39	33,3	18,5	
	40-44	16,7	22,2	
	45-49	10,0	16,7	
	50 and older	3,3	5,6	
Home language	Afrikaans	4,9	0,0	The majority of learners are Tswana and Xhosa speaking, with a very low number of English-speaking learners. The majority of learners at Vista University speak one of the African languages. This factor has always been considered when developing training material in the past and was therefore considered in the development of this training website. Because the learners speak a variety of languages, the medium of instruction of the programme is English.
	English	4,9	1,6	
	Northern Sotho	14,6	17,5	
	South Sotho	9,8	8,0	
	Tswana	17,1	25,4	
	Venda	7,3	6,4	
	Xhosa	22,0	17,5	
	Zulu	14,6	11,1	
	Tsonga	4,9	11,1	
Ndebele	0,0	1,6		
Province where learner resides	Eastern Cape	7,5	10,5	The majority of learners reside in the northern part of the country. However, there are a notable number of learners from the Eastern Cape and North West Province. The contact sessions take place in Pretoria, which is accessible for most learners. When the need arises, contact sessions will be offered at other venues around the country. Video-conferencing is an alternative mode of facilitating contact with learners. Video-conferencing was used to make contact with learners from the Eastern Cape in 2002.
	Western Cape	7,5	0,0	
	Free State	12,5	6,3	
	Gauteng	37,5	43,8	
	KwaZulu Natal	10,0	4,7	
	Limpopo province	15,0	14,1	
	Mpumalanga	2,5	7,8	
	North West Province	7,5	12,5	
Marital status	Single	22,0	43,8	In 2002, just more than half of the learners were married. In 2003 there were more unmarried learners. There are a number of women who experience domestic-related problems which impinge on their studies. Sometimes their partners do not approve of their studying. Such learners often become targets of domestic violence or other related incidences (angry partners, for example, may destroy their study material). Facilitators should be sensitive to these kinds of problems.
	Married	53,7	35,9	
	Separated/ Divorced	17,1	14,1	
	Widowed	7,3	6,3	

□ Task analysis

According to Gottfredson (2002:4), “A task is a discrete set of steps that together achieve a specific outcome.” A task analysis involves the identification of knowledge, skills and attitudes that learners need to acquire in order to achieve the instructional goals. It also identifies the information that learners need, as well as necessary concepts and rules (Lee & Owens, 2000:29; Jolliffe, et al., 2001:59).

Since all the courses offered in the Social Behaviour Studies and HIV and AIDS programme were completely new, all the facilitators involved in the programme conducted a brainstorming session and identified the tasks and related content that would be necessary to achieve the outcomes that they had set for each specific course. It was decided to use the nutrition and HIV and AIDS course as a pilot project for purposes of design and in order to develop a training website. This decision was motivated by the fact that the nutrition and HIV and AIDS course was one of the first courses of the programme that had been developed and offered. It also became apparent from the low marks that learners achieved after the first year of offering the course, as well as personal interviews and group discussions that learners experienced the course content as unfamiliar and difficult. They experienced these problems because they had no or very little prior knowledge about basic nutrition. Facilitators from some of the other courses in the programme reported the same problem.

It is important when developing learning website materials to formulate outcomes that indicate what learners should be able to do as a result of the performance (Jolliffe et al., 2001:27) – especially in those cases where the content is unfamiliar to the learner. Where possible, learning outcomes should be aimed at real-world applications while promoting thinking on creative (generating original ideas or options) cognitive, and metacognition (monitoring, evaluating and revising own thinking) levels (Jolliffe et al., 2001:27). Beattie (1994:249) suggests that the three learning domains of Bloom’s taxonomy suited for formulating learning objectives are:

- The cognitive domain which involves thinking and knowing
- Psychomotor domain which involves practical relevance
- Affective domain which involves attitudes and values

I formulated the specific course outcomes as follows:

- Learners will be able to apply basic principles of nutrition related to HIV and AIDS.
- Learners will be able to identify and apply various health models that apply to HIV and AIDS.
- Learners will be able to understand and communicate the various health factors that influence HIV and AIDS in South Africa to others.
- Learners will be able to link health promotion principles to the management of HIV and AIDS.

The critical outcomes supported by this course are:

- Organise and manage learners and their activities responsibly and effectively.
- Collect, analyse, organise and critically evaluate information.
- Communicate effectively by using visual, mathematical and/or language skills in the modes of oral and/or written presentations.
- Identify and solve problems in which responses give evidence that responsible decisions have been made on the basis of critical and creative thinking.
- Work effectively with others as a member of a team, group, organisation or community.
- Demonstrate an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation.

To achieve these course outcomes, the components of adult learning which are based on behavioural and developmental theories (see Knowles, 1990, in Lee & Owens, 2000:30), and which are outlined in Table 3.3 below, were taken into consideration during the development of the website. The components listed are relevance, involvement, control over learning and non-traditional learning situation.

Table 3.3: Components of adult learning (Knowles, 1990, in Lee & Owens, 2000:30)

Component	Description
Relevance	Adult learners must see the direct relationship between the topic of information to be learned and the real world in which the knowledge is used.
Involvement	Adult learners must be actively involved in the learning process, rather than sit passively and listen to or watch the instructor.
Control over learning	Adult learners must have independence to learn where, what, and how they learn best.
Non-traditional learning situation	Adult learners need privacy for learning and individualised, self-paced instruction so that they can learn at their own rates.

Adult learning as illustrated in Table 3.3 is focused on actively involving the learners in applying knowledge to real world situations while allowing them their independence and privacy.

The task analysis provides an outline that serves as a guide when developing competency-based e-learning (Gottfredson, 2002:9). It identifies what is needed to achieve the instructional goals which assist one to determine the content that should be included in the course. The content analysis will be discussed in the next section.

□ Content analysis

I conducted a content analysis in order to determine what the course should contain. Study material for the nutrition and HIV and AIDS course was developed in 2000, and consisted of:

- **Printed material:** A study guide with activities, readings, assignments, and a tutorial letter.
- **Contact sessions:** Two, one-week contact sessions during the first half of the year (course duration is six months) in Pretoria. Video conferencing facilities are available should the need arise.
- **Communication channels:** Telephone, facsimile, e-mail, and personal appointments with facilitator.

The study guide comprises six units that deal with various topics on basic nutrition and nutritional care and support for PLWHA. Each unit has explicit outcomes and a number of activities that learners have to complete. The activities and assignments comprise prescribed readings, interviews, the writing of speeches and reports, and the making of educational visual aids. Completion of the activities is optional. The activities function as a guide to the unit because each activity is relevant to a certain section in the unit. The assignments require the learner to apply some of these activities to real-life situations. The assignments are submitted for assessment on or before the due dates. Learners are provided beforehand with criteria for assessment. The assignments are then assessed and scored according to these criteria. The readings comprise a number of articles, information pamphlets and extracts from various textbooks.

From discussions with learners and observations made when this course was offered during 2001, it became apparent that learners needed more background knowledge on nutrition. These learners have limited resources – especially when it comes to access to factually correct literature – and there were insufficient opportunities for interaction between the facilitator and learners. These problems identified the need for other means of delivering content than the printed format.

Jolliffe et al. (2001:67-68) suggest a framework with a number of questions to determine if the learning event is suitable for online delivery. The questions regarding the content are listed in Table 3.4 on the next page. The responses are related to the nutrition and HIV and AIDS course.

Table 3.4: Questions and responses regarding the suitability of the subject matter for online delivery (Jolliffe et al., 2001:67-68)

Question	Response	Related remarks
Has the learning event been delivered before?	Yes	If previously developed material exists, which has already been delivered and evaluated, it is advisable to adapt and use such materials for online delivery. The course material has been developed and delivered, and its effectiveness has been evaluated and improved upon. Research proved that the redesigned course material was more effective.
Are motor skills a major prerequisite for the learning event?	No	Developing and assessing online learning material is difficult, costly and time-consuming.
Are socialisation and the changing of learner attitudes important prerequisites for the learning event?	Yes	A face-to-face environment is a better setting in which to change people's attitudes. While certain kinds of counselling and social work are difficult to design for the web, the purpose of this course is to expose learners to concepts and to demonstrate how these concepts are applied in real-life situations. By means of this process they are provided the opportunity to experience the value of what was taught and form their own opinions.
Do the learning materials need to be updated on a regular basis?	Yes	Nutrition is a dynamic field of study that constantly produces new findings based on evidence obtained from published research. Learners need to be made aware of this information.
Are there existing relevant resources on the web?	Yes	If there is a large amount of subject matter and other information relevant to the event available on the web, then it is probably suitable for web delivery. There is a major source of information on HIV and AIDS available in the web. A good number of reliable resources on nutrition, especially basic nutrition, are also available. The course on Nutrition and HIV and AIDS takes the form of a learning guide that directs learners to relevant materials and provides links between them.
Is self-pacing an important aspect of the learning event?	Yes	The target population data shows that learners are diverse in background, circumstances and experience. Learners need more control over their learning because some learners are more knowledgeable about nutrition and/or HIV and AID than others. Experience has also shown that there are some learners that work much more slowly than others for a variety of reasons. Self-paced learning is thus well suited for online delivery.
Is the delivery of multimedia essential to your learning event?	No	The delivery of audio and video components, as well as photographs and graphics, to learners can be problematic because of limited bandwidth. The audio and video components can alternatively be delivered through CD-Rom. What needs to be reconsidered is whether such delivery is essential for the learning event.
Do you have existing computer-based resources that can be converted to online materials?	Yes	If relevant word-processing and electronic-presentation files are available, they can easily be converted for use on the web.

Table 3.4 listed eight questions regarding the suitability of the subject matter for online delivery. Each question was answered with a yes or no and a related remark supporting the response was given. Since most of the answers to the questions listed in Table 3.5 were supportive of web-delivery, one may assume that the content for this course is well suited for web-delivery and e-learning.

□ **Instructional strategy analysis**

Various instructional strategies were investigated in order to determine the strategy that would be best suited to the course. An instructional strategy investigates how materials presented to learners will facilitate learning and enable them to achieve the course performance objectives (Jolliffe et al., 2001:75). The following strategies were analysed and found to be best suited for utilisation in the website:

▪ **Micro-level instructional strategy**

For the micro-level instructional strategy the following five-step approach was followed:

- Introducing the learning event and its stated objective
- Presenting information structure and content sequence in a manner suited to learners
- Providing activities (in the form of computer-aided performance feedback provided on basic knowledge activities) that allow learners to apply the knowledge they have gained
- Assessing learning outcomes by determining what knowledge and skills were gained during interaction with the learning event
- Providing follow-up and remediation measures to assist learners who have not achieved the learning objectives

▪ **Macro-level instructional strategy**

On the macro-level, I used the non-linear and exploratory learning event instructional strategy. These two learning events are briefly described below.

▪ **Non-linear, exploratory learning event**

The website is structured in a non-linear manner, and provides learners with the freedom to find and explore the information and concepts associated with the learning event in a manner that is suited to each individual. The website home page introduces various topics and describes what each topic deals with when one moves the mouse over it. Topics are represented by word(s) on a button, and these buttons act as links to other pages in the learning event. Learners have the opportunity to choose whether to explore a topic, to form an idea of what the content entails, and to get an overall picture of how various sections of information relate to each other.

Activities exemplify the concepts and principles of social learning, discovery, guided, constructivist, and social constructivist theory. The assignments are structured in such a manner that learners have to perform activities and/or read relevant text before giving their opinions and providing solutions to the question concerned. The learning website provides them with electronic reference documents such as reports, guidelines, literature reviews, fact sheets and links to other relevant websites that (in turn) provide them with the information they need to complete the assignment.

□ Media analysis

It is vital to select media systematically and carefully if one wants to implement effective and cost-effective e-learning solutions (Lee & Owens, 2000:48). The various media and technologies listed in Table 2.29 (chapter 2) were considered for use in the course. Those listed in Table 3.5 below were selected for the distance education nutrition and HIV and AIDS course. Table 3.5 comprises the selected computer-based, computer communication primarily image-based media, print-based, telecommunication-based and human-based media and the technologies associated with these media.

Table 3.5: Media and technology selected for the nutrition and HIV and AIDS course

Medium	Technology
Computer-based	Computer Compact disk (CD)
Computer communication	E-mail Internet Online documentation Computer-aided testing
Primarily image-based	Graphs Graphics Illustrations
Print-based	Study guides Readings Assignments
Telecommunication-based	Telephone Facsimile
Human-based	Facilitator Any form of face-to-face contact

Table 3.5 listed the media and the technology associated with these media that was selected for the distance education nutrition and HIV and AIDS course. The next section will look at the situation analysis.

□ **Situation analysis**

There are a number of constraints that can have an influence on the effectiveness of e-learning and the Internet as part of a distance education course in nutrition and HIV and AIDS. Table 3.6 below and Table 3.7 on the next page list the constraints that were identified in Table 2.11 and are applicable to the Nutrition and HIV and AIDS e-learning course (in the section of chapter 2 that dealt with a needs analysis and possible solutions to constraints that affected learners in an e-learning situation). The constraints include in Table 3.6 are, learners need computer and Internet access, learners' computer experience, learning environment and learner motivation.

Table 3.6: Learner constraints identified during the needs analysis and possible solutions concerning learner computer and technology needs

Constraint	Possible solution(s)
Learners need computer and Internet access	Approximately 50 per cent of the learners indicated that they had computer and Internet access. Vista University has seven learner support centres around the country. These centres provide learners with computers and access to the Internet. The VUDEC campus in Pretoria has twenty Pentium4 computers that are used almost exclusively by postgraduate learners. Learners who have access at work might be given permission to use such facilities for study purposes. Learners can also make use of Internet cafés. The course can also be offered in a CD-Rom format. Such a format offers all the benefits inherent in CD-Rom use. Students will then only have to access the Internet when they want to view links to other websites.
Learners' computer experience	The programme management committee of the Social Behavioural Studies in HIV and AIDS Honours Programme believe that learners at a postgraduate level should be computer literate. In the programme's degree guidelines, it is stated that learners must be computer literate. Learners are also required to submit typed assignments. The target group analyses indicated that more than 40 per cent of learners viewed themselves as computer literate or are able to operate computers without assistance. Learner observations during the research period showed how quickly most computer illiterate learners picked up basic computer and Internet use. One student made the following remark after an introductory session on the Internet: "I cannot believe it. I can work on the Internet!" Most learners realise that they have to be computer literate, not only for study purposes, but also to compete in the job market. Some learners have taught themselves word processing and others have enrolled for computer training. Vista University offers an introductory course in computer use. Computer illiterate learners are strongly recommended to enrol in this course.
Learning environment	When one considers Vista University's facilities, one may rate the learning environment as acceptable to good. The needs analysis shows that less than 22 per cent of learners viewed their learning situation as "difficult".
Learner motivation	Many learners studying in the field of HIV and AIDS feel strongly motivated by this highly emotive issue. Facilitators also encourage learners to discuss their study problems with them.

Table 3.6 lists the constraints concerning learners and staff identified during the needs analysis. Possible solution(s) were given to resolve these constraints in relation to the nutrition and HIV and AIDS e-learning course. Table 3.7 list the next number of constraints that can have an influence on the effectiveness of e-learning and the Internet as part of a distance education course.

Table 3.7 on the next page lists the next number of constraints of which some were identified in Table 2.11 (in the section of chapter 2 that dealt with a needs analysis and possible solutions to constraints that affected learners in an e-learning situation). The constraints include costs of Internet connection, pedagogy, pedagogy and the www, subject matter, printed study material, computers and Internet access for teaching staff and support for e-learning.

Table 3.7: Learner and staff constraints identified during the needs analysis and the possible solutions that can have an influence on the effectiveness of e-learning and the Internet as part of a distance education course.

Constraint	Possible solution(s)
Costs of Internet connection	If learners access the Internet for long periods from home, this can be extremely expensive. Connections after hours and over weekend are cheaper. Employers bear the costs when learners access websites from work. Internet access is available from Vista University and is free of charge.
Pedagogy	To limit the constraints associated with various media, attempts are being made to incorporate alternative media that take costs and other resources into account. By implementing e-learning, and encouraging the use of the Internet, e-mail and discussion groups, attempts are being made to dispel the feelings of loneliness and isolation to which remote learners are especially prone. My co-workers and me also found that face-to-face sessions every three months greatly alleviate the sense of loneliness and isolation.
Pedagogy and the www	In order to assist learners to create order out of all the information to which they are exposed on the web, each unit contains literature and links to content that is associated with the subject matter that is covered in the unit.
Subject matter	Subject matter is suitable for online delivery. (Mentioned in Table 3.4.)
Printed study material	A major constraint that afflicts printed study material is the problem of distribution . The postage system is slow and unreliable, especially in remote and rural areas. Some learners receive their study material late and sometimes it gets lost in the post. The issuing of study materials can also generate problems. Learners are often issued with the wrong or incomplete study material. Learners realise this only after they have returned home or (more seriously) later in the year. Issuing materials later in the year is highly inconvenient and may cause delays in the submission of assignments. If updated course content is published on the Internet or if learners have been issued with a CD-Rom containing updated course content, they will have an alternative source of content to work with while they wait for their printed material.
Computers and Internet access for teaching staff	Staff who are involved with the course have computer and Internet access with ISDN connections.
Support for e-learning	Staff involved with the Social Behavioural Studies in HIV and AIDS Programme is supportive of e-learning. They are enthusiastic and willing to learn.

Table 3.7 lists the remaining constraints concerning learners and staff identified during the needs analysis. Possible solution(s) were given to resolve these constraints in relation to the nutrition and HIV and AIDS website. Table 3.8 list constraints associated with infrastructure and the organisation.

Table 3.8 below lists a number of constraints (from Table 2.12) concerning infrastructure and organisation that were identified during the needs analysis. The constraints include technology infrastructure, additional questions about technology infrastructure, organisation and organisational support.

Table 3.8: Infrastructure and organisational constraints identified during the needs analysis, and possible solutions concerning infrastructure and organisation

Constraint	Possible solution(s)
Technology infrastructure	The workstations at Vista University have the minimum-required operating system, disk storage space, and memory capacity built into them. These computers have the latest (or one later version) of Internet Explorer with support. The computers do not have sound cards or CD-Rom drives. Learners have access to a printer on a LAN within the building, often in the same room.
Additional questions about technology infrastructure	Personal computers are not frequently replaced at Vista University. This limits the utilisation of technologies such as sound and video. At the VUDEC campus, the bandwidth can accommodate user demand. However, some of the other campuses and learner support centres have a limited bandwidth. This can become problematic at peak times and when large numbers of learners use the Internet simultaneously. At an earlier stage of this research, server availability was reliable. However, for the past six months reliability has become a problem. If this situation persists, the problem will have to be addressed.
Organisation	Vista University does not have a Learning Management System (LMS) or Learning Content Management System (LCMS) in place. Current learner numbers are manageable and the managerial processes are done manually and with existing facilities. Web authoring, graphics and animation software is available. No synchronous communication software has been installed.
Organisational support	The Department of Information Technology provides support. Funding for staff training is allocated from the programme budget.

Table 3.8 lists the constraints related to infrastructure and the organisation identified during the needs analysis. Possible solution(s) were given to resolve these constraints in relation to the Nutrition and HIV and AIDS website. The next section discusses the design phase.

3.2.2 The design phase

The printed study material for the nutrition and HIV and AIDS course was developed and implemented first. After offering the course for one cycle (the duration of which was six months), I designed the learning website. (This was done in the year that followed.) A team approach was adopted. This meant that the subject expert (me) provided the subject content and I developed the website with the assistance of a freelance website designer. We were responsible of all aspects of the design and development of the website. Members from the programme management committee also provided input.

The design of the website was influenced by the fact that most learners only possessed basic computer skills. The design of the website was therefore deliberately kept simple and its features were made consistent. The design is essentially unstructured and allows learners to make their own choices. This allows learners to explore the learning event (Jolliffe et al., 2001:186).

The learning website comprises the following features:

- A home page containing a navigation bar with topics that are related to the course content and a *HOME* button that allows learners to return to the home page whenever they need to.
- Navigation links between pages.
- A number of **descriptive words** at the top of each page indicate the various topics and units into which the learning event is divided.
- A set of consistent links.
- Each unit comprises:
 - An introduction to the unit
 - The learning outcomes of unit
 - Learning activities with a list of resources and links to other resources
 - The assignment activity
 - Assessment criteria
 - An overview of the unit
- An assignment page with links to additional resources.
- An opportunity for learners to construct their own knowledge map of the course content, that shows the relationship between elements. Learners are taught how to categorise and create a hierarchy of information. (Screen captures are given under section 3.7.2 Layout of website).

The website has to function as an alternative instruction delivery tool that promotes learners' creative processes, critical thinking, interactivity, and individual and group work (Bonk & Reynolds, 1997:168). In order to achieve this, I had to ensure that the interface design and content were appropriately designed (Hall, 1997:188 & 191). The following section discusses the interface design.

□ **Interface design**

I decided to utilise a learner-centred (user-centred) design principles on the basis of the needs assessment and research outcomes. Norman (1988:188) characterised user-centred design as “a philosophy based on the needs and interests of the user, with an emphasis on making products [that are] usable and understandable”. He further defined *usable* as a product which the user knows how to handle, and something as *understandable* when the user can tell what is happening. Because the user is the focal point of the whole enterprise, designers should develop useful and user-friendly applications for users, and the needs and difficulties of users should be the primary focus of designers right from the earliest stages of the design process (Benjamin, 2000:2) Online courses that have well-designed interfaces secure the attention and interest of learners in the learning event – thereby (1) ensuring their engagement with the content, and (2) increasing their levels of motivation, satisfaction and success (Powell, 2001:44).

I utilised the interface design principles described in the following sections (Reeves, 1994:[Online]; Jones & Farquhar, 1997:241-242; Ruffini, 2000:58) when I designed the website.

▪ **Page design**

Web pages were kept simple and clear and the layout was made to look and function predictably and consistently. Page density was kept low by the judicious use of white space. A balance was kept between text, links and graphics so as to maintain visual balance and focus learner attention. Graphics were kept small so as to allow for quick loading. I kept *Body Text* consistent by using the same text, font style and size throughout. Mixed type sizes, styles and text attributes were used for emphasis and variety. Text was set left-justified. The page background was kept white and the text was kept black in order to maximise information legibility and clarity.

▪ **Page and text line length**

Scrolling was limited by extent of text and information. Content was “chunked” so that learners could direct their own learning. Text line-length was limited to 60 characters or less.

▪ **Structural cues**

Information was arranged through techniques such as “chunking”, overviews and a fixed display format. The same design style was applied to the web pages and the navigation bars were always placed in the same locations. This gave structure to the information.

▪ **Selectable areas**

Identification of selectable areas was emphasised by the use of existing web-browsing

standards. Hyperlinks are all coloured royal blue, and interactivity is indicated because the cursor changes to a “pointing hand” when it is moved over a “hot” spot. When a selectable area is selected, the system registers the selection and the royal blue colour changes to purple.

- **Navigation**

Since learners’ computer experience was limited, navigation was kept simple. All navigation links were appropriately labelled with text to avoid misinterpretation. Links were prioritised and the number of links was then limited. When the cursor moves over a main menu link, an explanation of the link appears. All navigational links were placed on the left-hand side and at the top of the page. The navigation hierarchy was limited (where possible) to three levels.

- **Information organisation**

Tables and frames were used to organise and optimise information presentation. This facilitates learning for learners (El-Tigi & Branch, 1997:26). Tables were used to summarise and synthesise complex content. Frames were used to give structure to the content. Frames were limited to navigation components, the course name and the logo. Learners are able to scroll through framed information and link to other documents while keeping the navigation bar in sight. Since a large number of the target population has limited computer and Internet experience, the navigation frame that provides learners with indications of where they are, and where the HOME and other important buttons are, are always at hand. Important information was placed at the top of the page. In unit one, there are series of topic each on a different page. All the topic pages are labelled at the top of the page and when the learner clicks on a label it changes to a different colour to indicate where the user is.

- **Metaphor**

The metaphor of the site was limited to food groups. Because of the cultural diversity and cultural experiences of spatialisation of the target population, the effectiveness of a metaphor was either limited or non-existent. I decided not to make up a metaphor with no basis in the learners’ experiences and then assume it would help learners to acquire new knowledge (Ohl & Cates, 1997:27).

- **Content presentation**

The content of the website consisted of all the units covered in the nutrition and HIV and AIDS study guide. The first unit covered the basic concept of nutrition. Information about the function of food, the five food groups, the recommended number of portions per food group for various age groups and the major nutrients provided by each food group, were covered. This unit provided

learners with the background knowledge they needed to complete the assignment activities of the unit.

Each section (such as, for example, the five food groups) was “chunked” into lessons. At the end of each lesson there are self-assessment quizzes. The quizzes varied in presentation and included:

- Multiple-choice exercises
- Fill-in-the-gap exercises
- Short-answer questions
- Jumbled sentence exercises
- Mix and match (drag-and-drop) exercises

Input for the first quizzes was limited to checking a check box, followed by typing a short answer, and finally drag-and-drop exercises. During the design phase, learners were observed while completing the quizzes. It was noted that they all managed these navigational activities competently and enjoyed doing the exercises.

Each exercise is preceded with a description of how the exercise works. The questions in the exercises are randomly rearranged every time the learner chooses the same exercise. This eliminates the guessing of answers after previous attempts. The exercises offer hints if learners are not sure about the correct answer. However, they lose marks every time they use the hint option. After completing the exercise, they receive immediate feedback on the marks they obtained and a comment such as “Well done!” or “Sorry. Try again.”

The content of the other units was not adaptable for quiz-type exercises. Instead, it was aimed at information seeking. Learners were provided with PDF (Adobe’s Portable Document Format) formatted documents, links to relevant sites, and text resources (Readings). Learners are expected to use sources other than those provided in the website. Such sources would include, for example, electronic journal articles and other library resources.

Learner support should be made available to learners for so long as they are using the website. Support should be available for content-related problems as well as for other hardware and software problems. (The issues around hardware and software support for learners provided by the university are beyond the scope of this study and therefore it will not be discussed). The development of the website will be discussed in the next section.

3.2.3 The development phase

The developmental phase comprises a number of sub-phases. These sub-phases are discussed in the sections that follow.

□ Production processes

The first step in the development phase was the acquisition and structuring of the production tools involved in the development of the website. My co-website designer and me pursued the development of the website on the basis of the needs analysis, the design specifications, and the proposed research outcomes. Table 3.9 below gives an overview of the production tools and specifications and processes. The production tools listed in Table 3.9 include technology specifications, the authoring tool, content integration, graphic processing, development of layout grid and archiving.

Table 3.9: Overview of production tools, specifications and processes

Production tool	Specifications and Processes
Technology specifications	Intel Pentium III processor 64 MB Memory 18.6 Gigabytes hard disk Colour monitor of 800 x 600 pixel resolution Platform: Windows 2000 16-speed CD-Rom drive Laser scanner Target browser: Internet Explorer 4 Word processing suite: Microsoft Word 98 Adobe Acrobat 4
Authoring tool	Macromedia Dreamweaver3. A visual editor for creating websites and pages. Macromedia Fireworks3. A web graphic tool that combines a vector drawing application with a bitmap-editing program.
Content integration	<ul style="list-style-type: none"> • Text: Existing text and graphic sources are stored electronically. • Visuals: An artist made drawings to illustrate the content. These were scanned and stored electronically.
Graphic processing	Graphic file sizes were reduced for speedy downloads (while ensuring the maintenance of visual quality). The gif file format was used. This format condenses colour images for use on the web. It is well suited for images with areas of flat colour.
Development of layout grid	Layout elements: <ul style="list-style-type: none"> • Layers: Layers were used in the design. Layers were converted to tables for browsers that do not support layers. • Frames: These were used for navigational purposes.
Archiving	Files were saved on the hard drive and back ups were made on CD-Rom.

Table 3.9 listed the production tools and provided a description of the specifications and processes associated with each of the tools. The next step in the process was the layout of the website which is described in the next section.

□ Layout of the website

The layout of the website was structure as described in the previous section and comprises the following pages:

- Home page
- Introduction and information
- Content
- Assignments
- Resources
- Help

The following five pages gives screen images and descriptions of the layout of the web pages as they appear in the Nutrition and HIV and AIDS website.

The following screen image illustrates the home page of the website.

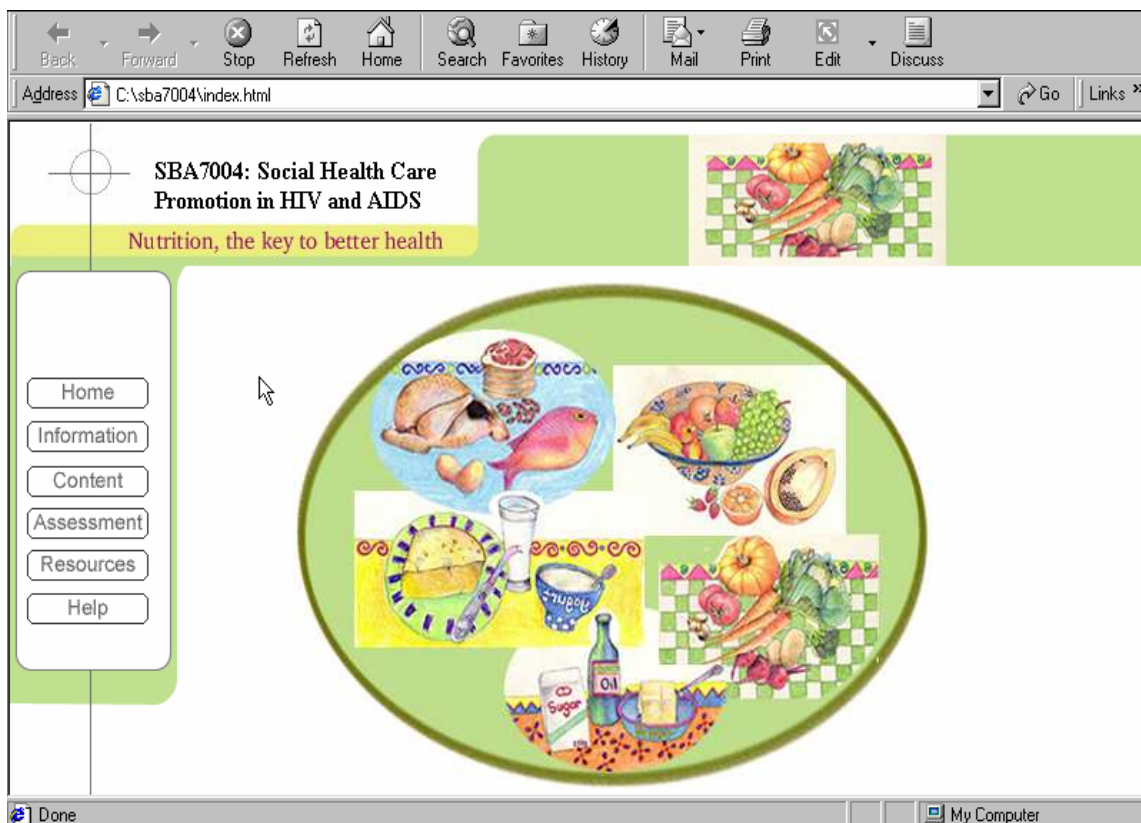


Figure 3.3: The home page of the website

After trying out a number of colours from the graphics, the web designer came up with the colour scheme that is illustrated in Figure 3.3. Food groups were selected as a theme because they

represent what is needed to maintain good nutrition and health. The name of the course and the course code appears in the top frame, and the main menu appears in the left-hand frame. The main menu provides options wherewith to connect to other sections of the site. The topics listed on the main menu were adopted after I had asked a number of learners and lecturers to indicate what information they felt was important to require a means of direct access.

The next screen image illustrates the information page of the website.

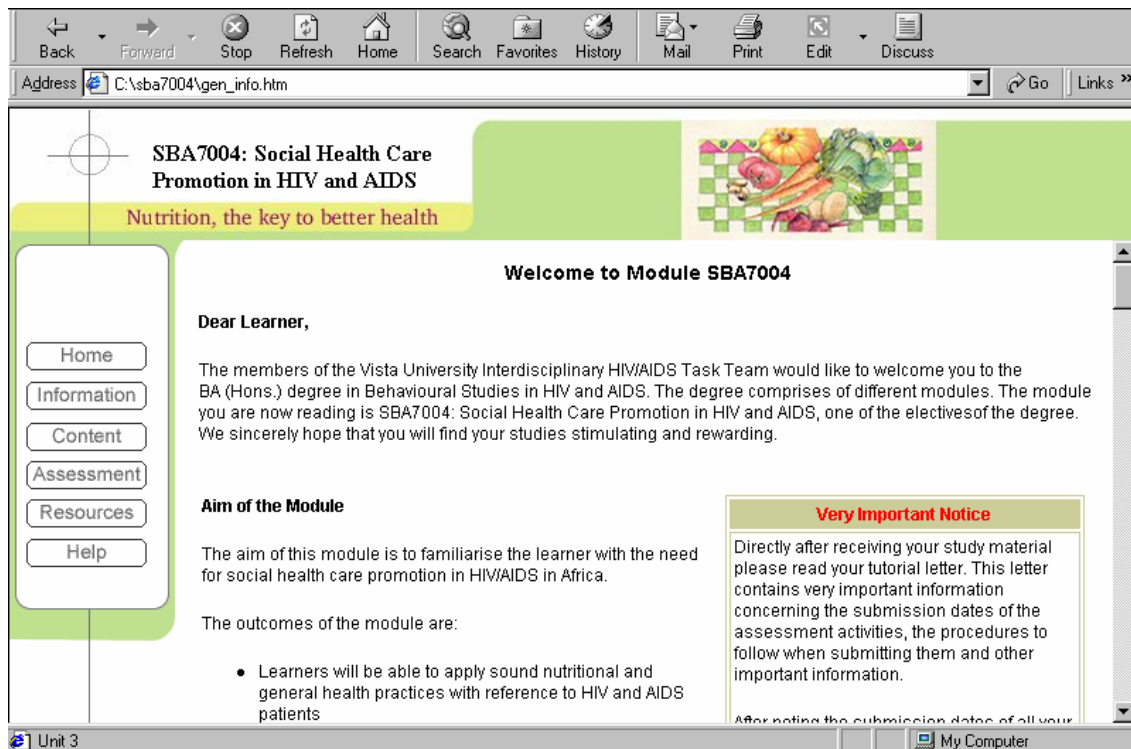


Figure 3.4: The information page

Figure 3.4 represents a section of the information page. This page welcomes the learners and informs them about the aims and outcomes of the course. The next section provides them with general information such as the lecturer's name, contact details, and methods of submitting assignments.

The following screen image is a section of a lesson page in the first unit of the website.

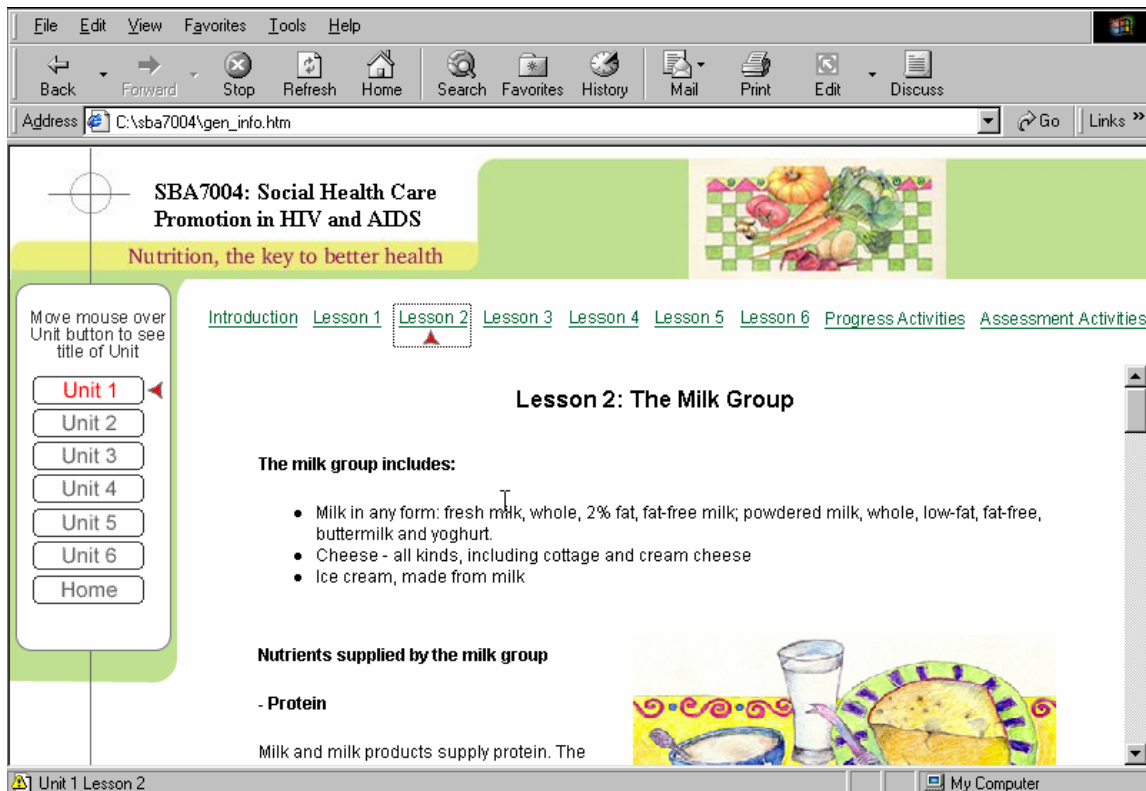


Figure 3.5: Visual indicators of where learners are in the website

The navigation buttons illustrated in Figure 3.5 provide visual indicators to learners of where they are in the website. Above the first button of the main menu, text tells learners that when the mouse is moved over the unit number, the unit title will appear. This application helps learners to orientate themselves and it also provides a means of synchronising the web pages with their text-based material. The graphics on the pages are relevant to the content. In this case, the graphic indicates which foods belong to the milk food group.

The following screen image illustrates the assignment page of unit one of the website.

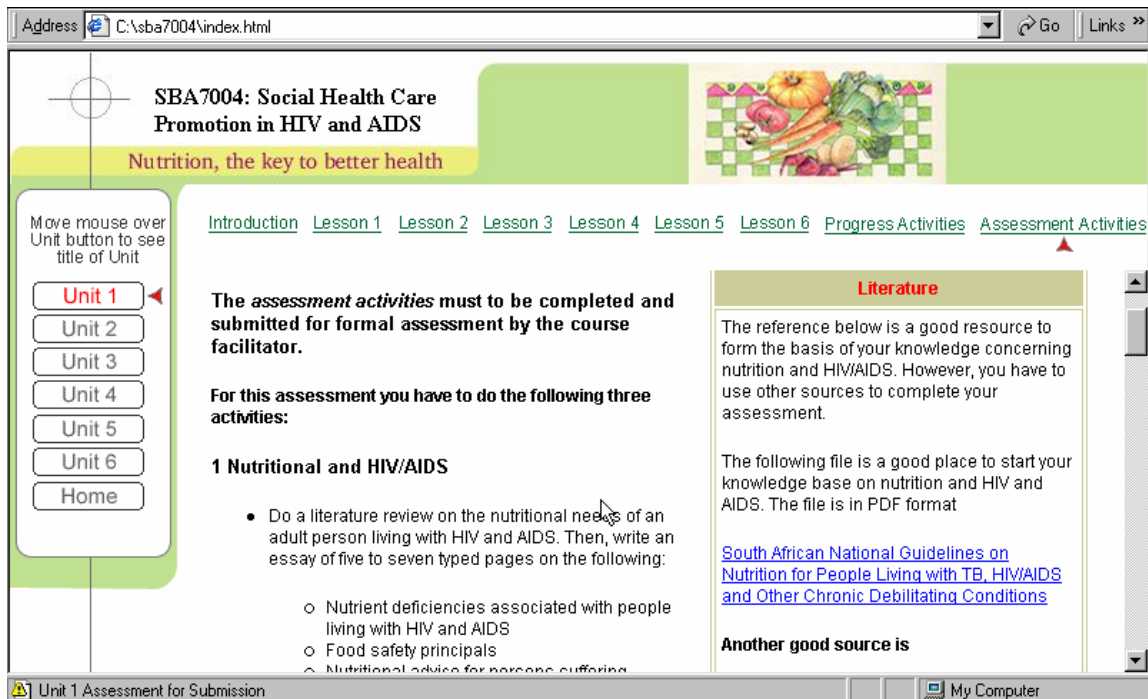


Figure 3.6: An assignment page

Figure 3.6 represents the assessment activities page (assignment page). The page provides links to relevant sources of topic information that learners can use to complete their assignment. The page also tells them what is expected of them as they complete the assignment and how they should submit the assignment. The assessment criteria for the assignment are also given on this page.

The unit quiz page, as represented in Figure 3.7 on the next page, is an example of one of the multiple-choice question quizzes. After the learner has completed the question, he or she can check the answer. If the choices are not correct immediate feedback in the form of "Sorry! Your answer is incorrect. Please try again." The learner loses marks if the answer is not correct the first time. This deters learners from choosing answers at random. If the learner submits the correct answers the second time round, feedback is given in the form illustrated in Figure 3.7.

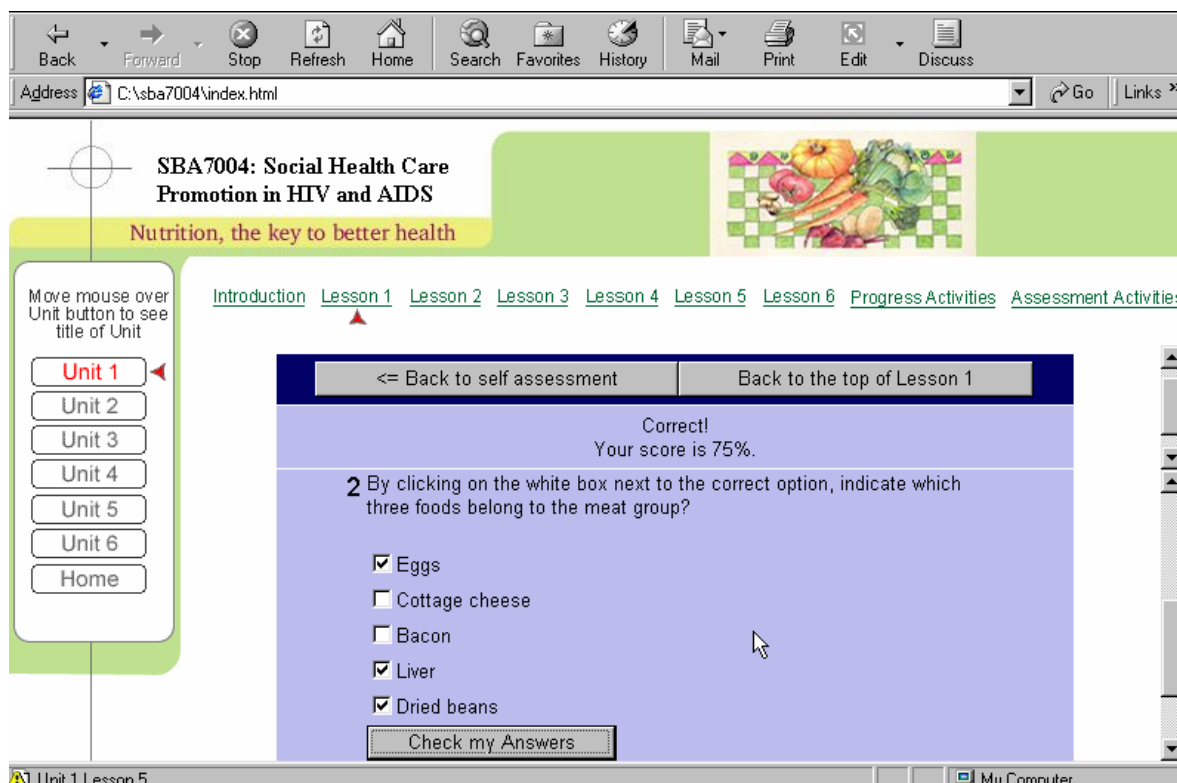


Figure 3.7: Multiple-choice questions

The page images of the website as illustrate on the pages above gives a general view of look and feel of the website and how the website is structured. The navigation bars and page layout are kept the same on each page and there are clear indicators to the learners on which page they are. The next section describes the evaluation and testing phase of the website.

3.2.4 Implementation phase

Staff from the Vista University IT department loaded the site to the server. The website was launched during a contact session in April 2002 at the VUDEEC campus. An introductory session was held during which the learners were informed of the purpose of the website. They were all given the opportunity to access the website and use it during the session. Training on how to use the site was also given at that stage. Subsequently, learners were given access to the computer room during the contact week and the following three weeks so that they could use the website when they worked on their assignments. Learners also had access to computers in the university library from where they were able to access the website. A facilitator (usually me) or a person from the computer department was available to provide support and guidance to the learners. During office hours the computer room was open for learners and they could contact the facilitator (me) to ask for support and guidance. During the period when learners were using the website and they had questions or made comments on the website it was noted by the person providing the support.

Each learner was issued with a questionnaires and consent form (see Appendix A). The consent form explained the purpose of the research. It also emphasised that completion of the questionnaire and participation in any other evaluation activities were entirely voluntary. Each learner partaking in the evaluation activities had to sign a consent form and hand it back to the facilitator (me). The learners were asked to use the website (during the contact week and at home) and look at all the sections of the website and evaluate it, and then complete the questionnaire and return it when they submitted their next assignment a month after the contact session. The assignment questions were structured in such a manner that learners who were not able to access the learning website could find the information relating from other resources.

During the period when learners were using the website, they could contact the facilitator (me) to ask questions or comment on the website. All such comments and questions were noted. During the contact session, I conducted personal interviews and focus group discussions with the learners. I also observed how learners interacted with the website during the introduction session and during the rest of the week. All incidents and comments were recorded during this time. The information was collected and sorted for use in combination with the formative evaluation phase questionnaires. The next section describes the formative evaluation phase.

3.2.5 Evaluation phase

□ Formative evaluation

Formative evaluation is concerned with the collection and analysis of data and information from learners during the design, production and implementation phases about the value and effectiveness of educational material and then used to improve it if needed (Laurillard, 1994:287; Maslowski & Visscher, 1999:244). Formative evaluation is “defined in terms of the learning processes it promotes and the learning outcomes it achieves” (Laurillard, 1994:287). Formative evaluation is a continuous process. It is first implemented at the pre-developmental phase after training needs have been identified. It is then continued throughout the formulation, design, and implementation of the final product phases, and it only ends with the revision of existing materials (Lawson, 1974:5). Formative evaluation should be carried out as soon as possible in the process so that the designer will have enough time for modifying and/or enhancing the features of an interactive learning system. This would forestall design errors that are expensive to correct (Reeves & Hedberg, 2003: 139 &142), and ensure the overall effectiveness, efficiency and appeal of the product (Reigeluth & Frick, 2003:2).

Fundamental to formative evaluation is the selection of the components of an instructional product (Bloom et al., 1971:118) and the subsequent determination of whether these components are effective or not (Lawson, 1974:5). There are a number of different ways of collecting information about components. Such information can collected from various people – ranging from the learner

target population who are going to use the learning product to subject matter experts (Reeves & Hedberg, 2003:139).

The data collecting tools that I used to conduct her formative evaluation will be described in the section below.

- **Interviews, formal and informal discussions**

Although interviews are labour intensive and expensive tools (because interviewers need to be trained and paid) – and it is therefore advisable to use a small number of learners (Laurillard, 1994:290; van Vuuren & Maree, 2002:282), such samples provide the researcher with an opportunity to explore learners' reactions and responses to the website's features and methodology. Interviews also help the designer to identify the strengths and weaknesses of the design. Once this information has been collected, the designer can then consider and implement improvements in the elements of the design (Reigeluth & Frick: 2003:10).

I used interviews that were open-ended and therefore less structured to obtain a variety of responses. The interviews were based on a number of set questions that allowed for detailed responses (Struwig & Stead, 2001:98). The open-ended format of these less structured and informal interviews helped me to discover new aspects of problems, clarify concepts and problems, and formulate possible solutions. The information gained from these interviews then enabled me to finalise the questionnaires (Bless & Higson-Smith, 1995:110).

- **Usability testing**

Usability testing is one of the primary activities carried out during formative evaluation (Reeves & Hedberg, 2003:61). "Usability inspection is the generic name for a set of methods that are all based on having evaluators inspect a user interface" (Nielsen, 2003a:[Online]). The primary aim of usability testing is to detect usability problems in the design of (for instance) a website. There are testing methods that can evaluate user interface specifications that have not yet been implemented. This allows for testing early in the usability engineering life cycle (Nielsen, 2003a:[Online]). Research has found that in about 60% of cases people cannot find the information they are looking for on the web. This is not only frustrating: it is a waste of time, productivity and money, and users will not visit the site again (Usability Basics, 2002:[Online]). *Usability* from a user's or learner's perspective can mean the difference between the enjoyment of completing a task accurately – or unbridled frustration, despair and anger. From a developer's point of view, the success or failure of a system depends a lot on the usability of the system (Usability first TM, 2002:[Online]).

Usability testing utilises a whole range of methods such as, for example, getting users (learners) to work with a website (or whatever other system is being tested). Results of a usability test are derived from what a user experiences as he or she works with a site. The site may exist only as a paper prototype. Or it may be a real working prototype or a site that has already been launched. The earlier one recruits users to try out a site, the faster and easier it will be for you to develop the site you want (Usability Basics, 2002:[Online]).

During the course of a usability test, users work through tasks within a site. The researcher (specialist) observe the users (learners) closely while they work, gathers data by observing and recording people's behaviour, feelings, attitudes and whatever events may occur (Bless & Higson-Smith, 1995:43; Struwig, & Stead, 2001:96). This method can be used to evaluate any unintended outcomes of a website (or program) and can also be used to identify areas that might be difficult to use, understand, or that are ineffectual (Laurillard, 1994:289; Reeves & Hedberg, 2003:149). Testing may include collecting data on the paths that users take to do tasks, the errors they make, when and where they are confused or frustrated, how quickly they complete tasks, whether or not they succeed in performing a task, and how satisfied they are with their experience. The goal of most usability testing is to improve a site by identifying and then eliminating any problems that users may experience (Usability Basics, 2002:[Online]). The unimpeded nature of participant observation complements more structured and controlled evaluation methods such as questionnaires (Laurillard, 1994:289).

During participant observation, learners go about their activities and are (ideally) unaware of the researcher who is observing them. Initially the focus of the researcher's observations is more general. It is only later (once focus areas have been identified) that the researcher will move her observations to more specific areas or features. The degree of involvement on the part of the researcher may range from interaction with the learners to total detachment. The duration of the observation process may range from a few hours to months or even years. *Reliability* becomes a concern if participant observation takes place in a single setting because "the issue [is] ... whether this [the single setting] was a chance event [or not]" (Struwig, & Stead, 2001:101). However, reliability can be enhanced if comparable findings occur across different settings (Struwig, & Stead, 2001:101).

There are many methods for studying usability, but the most basic and useful is user testing, which has three components:

- Select representative users, such as learners who have already enrolled for the course.
- Ask the learners to perform representative tasks with the design.
- Observe what learners do and ask them to make comments. Take note of where they succeed, what they enjoy (what gives satisfaction), and where they have difficulties with the user interface.

It is important to test learners *individually*. Allow the learner to experience the website independently. Do not offer assistance when a learner is experiencing a problem. If the test person is helped or if his or her attention is directed to a particular section of the screen, then the whole point of usability testing is defeated and the results are meaningless (Nielsen, 2003b:[Online]).

If one gets five users to run through a (for instance) website, one should be in a position to ascertain whether or not there are major usability problems in a website design. It is preferable to run many small tests rather than one large and expensive study. Repeated small-scale tests enable one to identify usability faults. These can then be repaired (between tests) as the site develops. The more versions and interface ideas are tested with the learners, the better (Nielsen, 2003b:[Online]).

Inspecting individuals is the best way of evaluating design usability. Using focus groups is not advisable. When evaluating interaction design, users have to be observed *individually* as they interact and perform tasks with the user interface. Because what users say can often be misleading, they have to be individually watched by the assessor as they work on the interface (Nielsen, 2003b:[Online]).

Usability testing was done during 2002 and 2003 at Vista University's Mamelodi campus and at VUDEC. Notes were taken during the usability testing and feedback about screen design, interface, navigation and learner-centred design was collected.

There are three basic development methods that are applied during the development phase of a website:

- Paper prototyping
- Rapid prototyping
- Usability testing

In the early stages of design, one uses *paper prototyping*. A paper prototype comprises hand-drawn paper-based representations of the site design. The purpose of a paper prototype is to clarify *requirements*. It also a flexible way to facilitate draft interaction and screen designs for speedy simulation and testing throughout the iterative design cycle before constructing a more permanent site design (Bevan, 2000:23; Preston, No date:[Online]). The four benefits of paper prototyping are the following:

- one can very early on detect potential usability problems in the design process before any code has been written.
- paper prototypes are fast to build, revise and to refine, and they allow for rapid design iterations.
- they promote communication between designers and users.
- minimal resource and materials are required (Bevan, 2000:23; Snyder, 2001:[Online]).

The second development method is *rapid prototyping*. This method comprises the production of quick temporary screens that are not fully functional. They do, however, allow one to test an interface with the help of prospective learners. The purpose of this method is to obtain inexpensive, quick feedback on the usability of prototypes. It is used for testing a simplified version of the design. Three to five users are needed, and they are encouraged to explain their interpretation of the screen content and their reason for making certain choices (Bevan, 2000:31; Danielson et al., 2000:125).

The third develop method is *usability testing*. According to Bevan (2000:28), the purpose of usability testing is to identify usability problems and to obtain measures of usability. Two benefits of usability testing are:

- to identifying critical usability problems, including problems related to the specific skills and expectations of the users
- to obtain user measures for effectiveness, efficiency and satisfaction.

Usability testing should begin in the very early stages of site development (Cato, 2001:191; Nielsen, 2003b:[Online]). It would be very difficult – if not impossible – to correct the range of critical usability problems that might emerge at the end of the development stage. Many of these problems are likely to be structural, and repairing them would thus require some fundamental redesigning of architectural features. High-quality user experience can only be achieved when user testing commences early in the design process and when testing is carried out at every step of the way (Nielsen, 2003b:[Online]).

Table 3.10 on the next page lists and describes the basic usability testing design steps. The steps include inspecting the old design, inspecting other designs, performing a field study, using a paper prototype, refining design, checking the design and inspecting while implementing the design.

Table 3.10: Basic usability testing design steps (Rubin, 1994:29-35; Nielsen, 2003b:[Online])

Step	Description
Testing the old design	Before redesigning the website, test and identify useable sections from the old site that can be kept as a feature of the new site's design. Also identify areas that gave users especial problems.
Testing other designs	Test other interface designs that have similar features to the one that you are developed. This is an economical way of collecting data for designs.
Performing a field study	Perform a field study to see how users behave in a familiar environment.
Using a paper prototype	Make paper prototypes of one or more of the new design ideas and test them. Do not spend too much time on them since they will need adjustments based on the test results.
Refining design	Identify the best design ideas that emerge from multiple iterations and refine them. Gradually move from low-fidelity prototyping to high-fidelity representations that run on the computer. Test each iteration.
Checking the design	Check the design by seeing to what extent it conforms to well-established usability guidelines.
Testing while implementing the design	Once the website is ready for implementation, test it once more. There are always subtle usability problems that emerge during implementation.

Table 3.10 gave a description of each of the usability testing design steps. Before redesigning an existing website, first identify useable sections from the old site and the areas causing problems. Then, test other interface designs with similar features than the one needing redesign. Perform field studies to establish user behaviour. Make paper prototypes of new designs and test them. After deciding on a new design, test design for conformation to usability guidelines, then test the design once more during implementation.

- **Expert review**

There are limits to the amount of criticism that a developer of an instructional website can assemble on his or her own website (Beattie, 1994:254). In the context of formative evaluation, an expert has specialised knowledge that is relevant to the website and is asked to evaluate the website on the basis of his or her individual expertise (Maslowski & Visscher, 1999:249; Reeves & Hedberg, 2003:145). The expert is in a position to assess many different features that affect the quality of the software, such as internal consistency, expected usability and effectiveness, while at the same time proposing possible improvements (Maslowski & Visscher, 1999:249). However, even peer evaluation has limitations. Peer reliability and validity may, in some cases, be questionable. How a task should be interpreted and what may look acceptable to a subject expert may look totally different to the end user (Beattie, 1994:254; Maslowski & Visscher,

1999:250). Even experts may be unduly influenced by some or other eye-catching gimmick or innovation – and lose sight of more important issues (Maslowski & Visscher, 1999:250).

- **Think-aloud procedure**

In this procedure, a representative sample of users are asked to verbalise their thinking processes while they interact with the product. This technique helps the researcher to establish *what* participants are doing and *why* they are doing it *while* they are doing it (Weston & Barker, 2001:18; Reeves & Hedberg, 2003:162). Information is collected on how learners experience the use of the website while they think aloud (Cato, 2001:195). Generally people are not used to thinking aloud (in public) and need prompting, reassurance and friendly encouragement during the process (Reeves & Hedberg, 2003:163).

- **Questionnaires**

Questionnaires are frequently used to determine, among other things, training needs, the evaluation of computer programs, the collection of personal information and the gathering of data for specific purposes (Maher & Kur, 1983:100). According to Cato (2001:210), it is important to gather information by means of a quantitative questionnaire that will identify and codify the user's perceptions, and (ultimately) will assist me to determine whether or not the website has been successful in achieving its outcomes.

My questionnaire was adapted from questionnaires developed by Beneke (1999) and Cloete (2001) to accommodate learners in Social Behaviour Studies and HIV and AIDS at Vista University. The researcher also consulted other sources that described the evaluation of educational software (Ravden & Johnson, 1989:29-42; Cato, 2001:211) and the correct design of questionnaires (Maher & Kur, 1983). The questionnaire comprised three sections namely, learner profile, formative evaluation and summative evaluation. The satiation recommended that for coding purposes, the three sections should be named as questionnaires A, B, and C and coded accordingly (See Appendix B, C and D).

After the questionnaires had been edited, three randomly selected learners from the target population were asked to evaluate the questions for clarity and understandability. After discussing their responses to the questionnaire with these three learners, I felt satisfied that (1) they had properly understood the content of questionnaires, and (2) the time that they had taken to complete the questionnaires was within acceptable limits.

The questionnaires comprised only closed questions. The questions in questionnaires A and C were structured as statements and learners had to indicate the applicable statement. The questions in questionnaire B were structured as statements that learners had to rate in terms of their experience.

A five-point Likert scale was used and the grading was as follows:

- 1 = I totally agree with the statement (TA)
- 2 = I agree with the statement (A)
- 3 = I cannot decide (neutral) (N)
- 4 = I disagree with the statement (D)
- 5 = I strongly disagree with the statement (SD)

Questionnaires were distributed to all the learners who attended the contact sessions in 2002 and 2003. Learners had to submit the questionnaires one month after the contact session when they submitted their next assignment.

The purpose of the learner profile questionnaire was to establish a profile of the learners enrolled for the degree programme (see Appendix B: Questionnaire A).

The purpose of the formative evaluation (see Appendix C: Questionnaire B) was to assess how the majority of learners experienced the following features of the website:

- screen display
- text layout
- graphics and colour
- content
- navigation and interaction
- the computerised format of the self-assessment activities
- the potential of the website to assist them in their studies

The next section describes the summative evaluation process.

□ **Summative evaluation**

“Summative evaluation examines evidence relating to indicators of programme effectiveness...” (Potter, 2002:212). Summative evaluation is conducted after all materials have been developed in order to determine if those materials are ready for continued and, perhaps, broader use. The outcome is typically a report providing suggestions regarding whether to continue or discontinue the website (Brown & Gerhardt, 2002:[Online]).

The purpose of this summative evaluation is not to prove that using a website as alternative delivery medium has improved learning. Research has shown that learning is not affected by the medium that delivers the instruction (Clark, 1994; Owston, 1999:[Online]). Research has, however, shown that factors such as learners control and self-pacing of learning, which e-learning provides, affect the learning process beneficially (Beattie, 1994:256). Summative evaluation is rather concerned with what the alternative medium has to offer learners and whether learners have learned what the course is designed to teach (Lockee et al, 2002:24; Laurillard, 1994:291).

After a new website has been fully introduced, the intended users evaluate it to determine the value of the website and the extent to which it offers something innovative or unique – or whether it should be discontinued. In this case the boundaries between formative and summative evaluation converge. The summative evaluation data becomes formative data when it is used to improve the website (Laurillard, 1994:292; Maslowski & Visscher, 1999:250).

The data collection methods used for the summative evaluation were:

- interviews, formal and informal discussions
- questionnaires

The summative evaluation questionnaire focused on evaluating the attitudes of learners to the use of a combination of media to train learners. (See Appendix D, Questionnaire C.) What was evaluated was:

- the delivery medium of study guide and tutorial letters
- the medium used for submitting and returning assignments
- media used of instruction and studies
- communication media

The next section discusses the research methodology.

3.3 Research methodology

3.3.1 Data collection procedure

The recorded qualitative and quantitative data was processed according to methods used, type of data, and the coding of the data gathered. Relevant statistical software packages were used to interpret the data. I will present the data in chapter 4 in the form of percentages, frequencies, descriptive statistics, histograms and diagrams to verify data and to draw conclusions with reference to experiences, views and recommendations concerning the course.

Table 3.11 on the next page summarises the data collection procedures that were employed in an attempt to answer the research questions in Table 1.1 (of chapter 1). The data collection procedures include analyses of literature relevant to the research topic, determination of learner needs, interviews, formal and informal discussions, usability testing, expert review, think-aloud protocol, establish user-centred design framework, learner profile questionnaire, formative evaluation questionnaire and summative evaluation questionnaire.

Table 3.11: Data collection procedures

Aim	Data collection	Data analysis	Outcome
Analyses of literature relevant to the research topic	Literature survey	Draw conclusions	Chapter 2
Determination of learner needs	Conduct needs analysis	Apply data in the design phase course	Chapter 3
Interviews and informal discussions	Conduct interviews and discussions Record interviews and remarks	Analyse and apply data	Chapters 3
Usability testing	Conduct observations Record observations	Analyse and apply data	Chapters 3 and 4
Expert review	Consult experts on issues about distance education courses Record comments and recommendations	Analyse and apply data	Chapters 3
Think-aloud protocol	Conduct think-aloud sessions Record comments	Analyse and apply data	Chapters 3
Establish user-centred design framework	Research user-centred design framework	Apply user-centred design framework and data collected from usability testing and think-aloud procedures	Chapters 3 and 4
Learner profile questionnaire	Compile learner profile questionnaire Distribute to target population Collect data	Qualitative analysis Quantitative analysis	Chapters 3 and 4
Formative evaluation questionnaire	Compile formative evaluation questionnaire Distribute to target population Collect data	Quantitative analysis	Chapters 4
Summative evaluation questionnaire	Compile summative evaluation questionnaire Distribute to target population Collect data	Quantitative analysis	Chapters 4

Table 3.11 listed and summarized the data collection procedures under the following headings: Aim, data collection, data analysis and outcome.

3.3.2 Data collection methods

The method I used for data collection was based on the concurrent triangulation strategy and used a combination of techniques. The model used comprised separate quantitative and qualitative data collection and analysis. The quantitative and qualitative data collection was done concurrently. Multiple forms of data collection were used for text analysis (Creswell, 2003:17 & 217) while questionnaires were used for statistical analysis. The tools that were used to collect data about how learners' experience the learning event included interviews, discussions, usability testing and questionnaires.

Data from learners in two separate year groups (namely, the years 2002 and 2003) was collected. A triangulation strategy was then utilised to increase the validity and reliability of the research. This involved using different data collection methods, the collection of data from different sources, and the qualitative and quantitative analysis of data (Mouton & Marais, 1988:91; Terre Blanche & Kelly, 2002:128).

The Social Behaviour Studies in HIV and AIDS programme is delivered through distance education and three one-week face-to-face contact sessions per year. I conducted interviews and usability tests and had discussions with learners during the contact sessions. During the usability testing I observed the learners as they worked with the website and significant incidents and comments were duly noted. Discussions were conducted to determine the learners' views on the course and the learning website. I made notes during these discussions. I also conducted formal and informal interviews with learners as well as with facilitators and subject experts in those departments which contributed to the Behavioural Studies in HIV and AIDS programme. The objectives of the interviews were the same as those for the discussions. I made notes during the informal interviews and audio-taped the formal interviews. I transcribed the audio-tapes afterwards. Questionnaires were distributed to learners during the second contact sessions at VUDEC and the Mamelodi campus of Vista University. Learners completed the questionnaires once they had spent some time using the website. The questionnaires were then statistically analysed.

Research questions 2, 4, 5, 7, and 8 (as set out in Table 1.1 of chapter 1) are directly related to the development of the website. The hypothesised attribute that generated each research question and the means that I used to investigate their validity, are summarised in Table 3.12 on the next page.

Table 3.12: Research questions and attributes addressed by the website

NO	Question	Attribute	Means of investigation
2	How can e-learning and the Internet be implemented in such a way so as to add value to a distance education postgraduate course in nutrition and HIV and AIDS?	New development	Questionnaires, interviews and discussions, expert reviews
4	What interface design principles would best facilitate the communication of nutrition and HIV and AIDS knowledge to adult learners from previously disadvantaged communities?	Appropriateness of applied interface design principles as experienced by learners	Questionnaires, interviews and discussions, expert reviews, usability testing, think-aloud.
5	To what extent does general web usability principles contribute to the communication of nutrition and HIV and AIDS knowledge to adult learners from previously disadvantaged communities?	Usability as experienced by learners	Questionnaires, usability testing, think-aloud, interviews and discussions, expert reviews
7	What media and technology are best suited for delivering distance education and what are the advantages and limitations of these modes for the delivery of distance education to adult learners from previous disadvantaged communities in the field of nutrition and HIV and AIDS?	Media preferences of learners Strengths and limitations as experienced by learners	Questionnaires, interviews and discussions, expert reviews
8	How should a distance education course that comprises a combination of media and technology be designed and developed so that it will be effective in training adult learners from previously disadvantaged communities?	New development	Questionnaires, interviews and discussions, expert reviews, usability testing

Table 3.12 listed the five research questions addressed by the website, their attributes including usability, media preferences, advantages and limitations and the means of investigation.

A number of hypotheses were tested using the Chi-square test for two-way frequencies. In the cases the test was conducted at the 95% significance level.

3.3.3 Description of data analysis

The research consisted primarily of a quantitative study, but qualitative measures were used to record the results of the interviews, formal and informal discussions and observations during the usability testing and think-aloud sessions. In essence the quantitative analysis represents the means by which I am able to summarize the result of the research activities by means of tabulation or graphical presentation and statistical analysis. Verbal or qualitative analysis of notes was used to draw up some constructive ideas about the design, development and production of the learning website. The constructive ideas were used in the design phases. Quantitative measures were taken in the formative and summative questionnaires.

The quantitative data was analyzed as follows:

Questionnaire A – The learner profile was presented in terms of percentages

Questionnaire B – Formative evaluation of learning website was presented in terms of percentages

Questionnaire C – Summative evaluation of a combination of media and technology as mode of instruction was presented in terms of percentages

Hypothesis testing – A number of hypotheses concerning the learning website and the use of a combination of media and technology for adult distance education learners from previously disadvantaged communities were tested. Hypothesis were presented in terms of frequencies and percentages

3.3.4 Evaluation and testing

During the evaluation and testing phase, the content, instructional design and usability was evaluated.

□ Interviews, formal and informal discussions

Interviews and informal discussions were held with the staff and learners who were involved with the programme. During the developmental phase, interviews and discussions were held among staff members, in which they related their view the implementation of a learning website to their courses and what the website should offer. They all agreed that the learning website should provide the study guide content and the assessments with links to relevant background information. They also agreed that the web design should be simple and easy to use since most of the learners were older adults with little computer experience.

Interviews with both the 2002 and 2003 group of learners were held during the contact sessions after they had evaluated the website. Learners were interviewed on issues concerning the effectiveness of the website, instructional and interface design, usability, content, learning experience and how they had experienced the website. They were asked if they had any

recommendations or comments to make. They were also asked to give their views on the effectiveness of the site and to state whether it had assisted them in their learning and in the accumulation of the information they needed.

Interviews were held with three volunteer learners from each year group enrolled for the nutrition and HIV and AIDS course. All these learners reacted positively to the website. They felt that the website was effective and that the content was relevant and would help them with their studies. They regarded the background knowledge with links to other relevant websites as being most helpful because they provided them with the relevant and basic information they needed to complete their assignment activities. They also felt that the website was a good alternative and/or support to the paper-based course content. They felt that the website provided them with easier access to course content. It also gave them a more convenient way of accessing useful information than going to the Vista library with its very limited resources. Although they had limited access to computers, they felt they would use the website for their studies. These learners became more positive about using the Internet and the website after they had been made aware of the computer facilities at VUDEC and at the tutor centres.

During the prototyping phase, technical features such as navigation consistency, workflow and that all links were active were tested. After the testing, and during the interviews, two of the five learners informed me that the order of the buttons at the top of the navigation bar was not consistent on two of the lesson pages and this was corrected. Three of the five learners experienced the top right-hand button labelled “Activities” as confusing because the first section of the linked page listed the progress activities before the assessment activities. After discussing the problem, we decided that it would be better to have a button for the progress activities and a button for the assessment activities. The learners also suggested that each linked page should give a clear description of what the activity required. All these adjustments were duly made.

Although the learners indicated that they found the quizzes most enjoyable, they also found that they were difficult to navigate. All the learners indicated that the links from the quizzes back to the content pages were problematic. These computer-generated quizzes were created in “Hot Potatoes” software, which is freeware. I kept on getting error messages when returning the content page after completing a quiz. After a number of failed attempts to correct the problem, I conducted an Internet search to see if I could find a solution. I came across a posting stating that there was indeed an error in the programming and that the “back button” did not function. To overcome this problem, I created my own “Back to self-assessment” button.

During formal discussions about the features of the website, the learners complained that they kept on failing the “Fill in the missing words” quizzes. When the learners and I had worked through the quizzes in question, I realized that when one is compiling a missing-word sentence or question, one had to make sure that there are only one or two correct options for the missing word. A question

such as “An example of a fruit high in Vitamin C is”, has too many correct options. The quiz program is structured in such a way that only the options provided, and only in the sequence the compiler has entered them as available, will return correct answers. It is in some instance nearly impossible to provide all the possible options in all the possible sequences. The program also only allows a limited number of correct answer options. During the prototyping, we came across at least one poorly formulated question per quiz, and these questions required quite a number of corrections before all the quizzes work well.

Initially the navigation bar in the left-hand frame contained a description of the content of each unit at the bottom of the navigation bar. After the prototype testing in 2002, two learners remarked during an informal discussion that they felt it would be better if the descriptions were placed at the top of the navigation bar. The description would then be more prominent and learners would notice it more readily. I made the necessary changes and the learners felt that they were beneficial.

During informal discussion with learners in 2002, it came to my attention that some of the assignment activities had not been clearly formulated. I revisited the assignment activities, and reformulated and added information where necessary. By 2003, there were very few requests to clarify the assignment activities.

Learners indicated through the formal and informal discussion that many of them enrolled for the Social Behavioural Studies in HIV and AIDS Honours Programme only became interested in this field of study after they had had to suffer the death from AIDS of someone close to them, or when they had to care for people living with HIV and AIDS, or when (as teachers) they saw their students living with and dying from HIV and AIDS. As they began to work as volunteers with PLWHA, some of the learners become aware of the importance of nutrition in the management of HIV and AIDS. They then wanted to know more about nutrition – and especially the nutritional and dietary needs of people living with HIV and AIDS. In addition they wanted to know how they could apply this knowledge to the real life situations that they encountered.

They also indicated that distance education was their choice of study because (1) many of them were working mothers, (2) they did not have the means or time to attend lectures, and (3) they needed more flexibility in their studies. They were only able to spend time on their studies later in the evening after they had attended to their work, tended to their children and taken care of their household responsibilities. Others working adults said they felt that they were too old to attend lectures with people half their age. They also felt they possessed a more focused and objective-attitude towards their studies than the average younger learner. During informal discussions, some learners indicated that they had enrolled for the nutrition course because it looked interesting and they did not know much about nutrition, while others based their choice purely on positive (or negative) comments from other learners or a particular facilitator, and/or on the availability of the facilitator.

Generally, during the discussions, the majority of learners indicated that they approved of the learning website and felt that it was a good idea to provide an alternative option for the delivery of course content. Many learners live located in remote rural areas with very limited (if any) resources of the kind that we associate with urban societies. Many learners reported that they had been presently surprised when got round to using the website. They found that it provided them with access to reliable and authentic information about the basic facts of nutrition, and nutrition and HIV and AIDS. There were links to websites and other information that they needed to complete their assignment activities. They agreed that the learning website provided them with easier access to reliable content that was not readily available to them in their homes.

The learners were pleased by the fact that they had been given a choice either to travel (for many a long distance) to the VUDEC Library in the hope of finding some information on the subject, or travel a much shorter distance to the nearest Internet café or Vista University learner support centre to access the website there. As one learner put it: "I am prepared to spend my weekends in the library or any other place as long as I have access to information." However, some learners indicated that they were not aware of the support provided by the learners support services or of the computer facilities. It was unfortunate since they were informed by post about the facilities on a number of occasions.

Learners were also enthusiastic about the course content. They enjoyed doing the interactive quizzes. They also felt that the activities and assignments were challenging and that they allowed them to interact with their peers and with other people who worked in the community. The assignments were based on problems that reflected real-life situations. They were extremely appreciative of the flexibility of the course that allowed them to re-submit assignments and improve upon their marks. Many learners remarked after the course had been completed that they had acquired important new knowledge and that – for the first time – they had realised how important nutrition is in the management of HIV and AIDS. They also reported that they had acquired many new skills and had improved their performance in a number of skills they already possessed.

While marking learner assignments I noticed how the provision of feedback and the fact that learners were given the chance to correct and then resubmit their assignments effected observable improvements in the writing skills of many learners during the course of the year. In addition, their ability critically to analyse content and construct their own knowledge also improved. Although learners still encountered various problems as they struggled to formulate their opinions, progress in these areas slowly became evident. Their assignments also revealed to me how their word processing skills and the presentation of their assignments improved. Their layout improved and their number of word processing errors decreased. When I remarked on their improvements, they all indicated how proud they were of themselves for acquiring some degree of mastery in computer management and how deeply conscious they were of how critically important such skills are in the times in which we live.

Many learners commented on the problems they experience with the distribution of their printed study material. A number of them were issued with incorrect or incomplete study material, or else they receive the materials late (or sometimes not all). This caused great frustration to the learners.

A number of learners remarked that they had felt lonely and isolated, especially at the beginning of the year. They do not know who their co-learners were and they did not have a co-learner with whom to share their problems and to consult. When they were asked whether they experienced such feelings throughout the year, they remarked that the situation had improved as the year progressed and as they had got to know their peers during the face-to-face contact sessions. They all felt strongly that there more contact sessions should be scheduled, but this was not possible because of staff and resource constraints. It is also expensive both for learners to attend such sessions and for the university to organise such sessions. Learners remarked that they had found the first contact session – and especially their first day – quite overwhelming, but that by the third day they had begun to settle down. The other sessions caused less of an upheaval in their lives.

Learners indicated that “real time chat sessions” were an unfamiliar concept to them and they neither knew what the term meant nor what to do in such sessions. I attempted to establish a chat room in 2002. Only two of the more computer literate learners (one from Cape Town and the other a Congolese temporarily based in Pretoria) used the chat room. And then they only used the chat room to establish possible links among HIV/Aids groups, and not for study purposes. They stopped “chatting” towards the end of the year when the Congolese learner had to complete his studies and return home. I did not attempt to reintroduce the chat room again in 2003 because of my prohibitive workload and because I would have been compelled to devote time that I could not spare to teaching learners how to use and participate in the chat room.

Learners who submitted their assignments via e-mail all remarked that they were pleasantly surprised at how quickly their assignments were evaluated and returned. They said that they felt that if they e-mailed their assignments, they could be certain that the facilitator would receive them – whereas the posting of assignments might mean that they would never arrive at all. When I remarked that I could not understand why their assignments were often late when they could send them by e-mail, it became apparent to me that learners had trouble with the management of their time and study schedules. They also indicated that they were not accustomed to such a volume of work and that the assignments required more time than they thought they would. They also remarked that their unfamiliarity with the subject content slowed them down.

□ Usability testing

During the prototyping two voluntary learners and a person from outside the university was asked to do the usability testing. I observed each of the three people while they did the test. They did not seem to have any problems with the navigation of the website, nor did they report that they had

encountered any difficulties with the use of the website. They all felt that the navigation bars and buttons were clear and unambiguous and that it was easy to navigate the website. At first they were not always aware of the red triangle just below the top buttons that indicated to the user the page that was open on the screen. As they became aware of it, they found that it was a helpful feature. They all approved of the website in general, and felt the learners would be able to work with it.

During 2002 and 2003 I observed learners as they worked in pairs or in small groups with the website. After I had made the necessary corrections and adjustments that I had identified as improvements during the prototyping phase, learners who were computer literate experienced no difficulties or complications with the navigation, the screen design or the interface. Predictably, however, learners with limited computer skills initially found it difficult to understand the structure of the website and were therefore also uncertain about how to navigate through it. These same learners were also unfamiliar with the uses of the mouse and the significance of double clicking. The scroll bar was strange to them, and they found it difficult to scroll with facility and confidence. But the more they used these features, the more skilled they became.

In some cases learners suddenly seemed to become overwhelmed and had no idea what to do next, although they had been navigating the website quite successfully up to that point. At times like these I found it difficult not to intervene or give guiding prompts. These learners then usually asked one of the other learners for help and, after getting instructions in their mother tongue, they were able to continue. I noted these and other such difficulties that the learners experienced.

Learners with limited computer skills often asked fellow learners who were more computer literate for help and advice about what to do when they got stuck. After explanations in their mother tongue and some practical guidance and help, learners were usually able to proceed. The more literate learners would often also give running commentaries while less literate learners navigated through the site. It was surprising to see how quickly most computer illiterate learners picked up basic computer and Internet usages and techniques.

The majority learners had little difficulty in navigating through the learning website and finding their way around the site. There were however one or two learners who just seemed unable to master the skills required for using the mouse and scrolling. These learners were not successful in using the website.

During the usability testing, most learners had little difficulty in navigating the website and finding the information that they needed – although at first it sometimes went slowly and they sometimes had to repeat some steps. Learners also enjoyed doing the quizzes. I had included a demonstration exercise that consisted of a very easy drag-and-drop activity. Nearly all the learners tried to complete this exercise and they were very pleased with themselves when they managed to score full marks.

After the novelty of working on the Internet had worn off and the learners had become familiar with the website, they began to suggest various possible improvements to the website. They showed me where they felt instructions and sections needed more clarification, pointed out a few spelling mistakes, and indicated where the design of the main menu needed adjustments to make it more user-friendly. They also felt that a more comprehensive Help file that contained FAQs (frequently asked questions) should be developed. I agree, and will send out a questionnaire that will ask learners how they feel the Help file could be improved.

□ Expert review

In spite of these possible problems indicated by the literature, I consulted subject experts during the various developmental phases of the website. The text was edited after the content had been compiled. Subject and instructional design experts were continually consulted on a formal and informal basis during all the developmental phases. During the implementation phase, four subject experts in Nutrition, Sociology, Education and Systems Analysis evaluated the website. They all gave the website a good review and felt that it would assist learners in their studies. The Education expert made some suggestions about how the formulation of the objectives of the units could be improved and I promptly implemented these suggestions.

I had asked the subject matter experts whom I consulted to review the content for clarity, comprehensibility, and accuracy. Since (by this stage) I had already been a distance education lecturer in Nutrition at VUDEC for 15 years, I did not anticipate that the subject experts would diagnose any major weaknesses with regard to the clarity, comprehensibility and accuracy of the content, and so I was gratified when none were reported.

□ Think-aloud

I recruited two learners and two lecturers who agreed to participate (Cato, 2001:195) in the think-aloud evaluation. The learner evaluation took place at the VUDEC computer laboratory and lecturer evaluation in their offices. The evaluation was conducted on a one-to-one basis. This particular location was selected because it was as similar to a real-life situation as could possibly be devised. Participants were given ten activities to complete the evaluation (see Appendix E). The think-aloud procedures were tape-recorded and afterwards evaluated by me.

I used the think-aloud evaluation to give me an indication (before I tested the website on the larger group of learners) of how the participants experienced and used the website. This method gave me an indication of how learners would go about finding information and completing activities. I could then see if the website was designed in such a manner that the users intuitively took the shortest route to accomplish the activities and if they experienced any difficulties in the process.

I attempted to design the website in such a manner that the users should not have to click more than three or four times to get to an activity or information. By testing the website on the participants I could hear their thought processes and see how they went about using the website and if I have achieved my design objectives.

I use lecturers to see if there were any differences in the manner which the lecturers (who were more experienced in using the Internet than the learners) used the website. Except for the learners being slower in reading and clicking on the buttons there were no notable difference between the learners and lecturers.

It was obvious that the participants found it very difficult to think aloud, and I constantly needed to encourage them to do so. The two lecturers were less inhibited with thinking aloud. Sometimes they stopped talking, but then they promptly started talking again before I needed to prompt them. In general, the participants had no problems in performing the required activities. I noticed that they often failed to read the instructions very carefully and so at first were often at a loss about what to do. Among the remarks made in this situation were: "Ugh, what now?", "Let's see, what must I do now?", "Oops! I had better read the instructions again" and "Yes, now I see."

Questionnaire

The result of the questionnaires will be discussed in chapter 4.

The analysis of above-mentioned qualitative data assisted me to identify important issues concerning the views of learners about the learning website and the problems they experience concerning the usability of the website. The data also provided me with information wherewith to design peripherals and instructional design factors that needed to be included in the design of the website in order to produce a suitable learner-centred tool to assist learners studying nutrition and HIV and AIDS.

Summary

This chapter dealt with the analysis, design, development, implementation and evaluation of the distance education course for nutrition and HIV and AIDS. An overview was given of how the empirical study was conducted, focusing on the needs analysis with its sub-sections, the identification of constraints and the selection of *appropriate solutions*, as well as the design, development, implementation, formative evaluation, and summative evaluation phases. Further attention was given to the description of the target population, development of the questionnaires and the various evaluation methods. My discussion also dealt with the methods used for gathering data – including formal interviews and formal and informal discussions, usability testing, expert reviews, think-aloud protocols and questionnaires. In the following chapter, I will discuss the findings of the study as they emerged from my application of each instrument.