Using Internet resources and e-learning modalities for training learners in Nutrition for people living with HIV and AIDS in South Africa

by

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Abstract

Title:	Using Internet resources and e-learning modalities for training learners in Nutrition for people living with HIV and AIDS in South Africa
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This thesis reports on a study conducted to investigate the design, development and implementation of a learning website as part of a distance education course comprising a combination of media and technology. The website functions as a tool for teaching distance education postgraduate adult learners mostly from previously disadvantaged communities whatever knowledge of nutrition they need to manage the symptoms and general health of people living with human immunodeficiency virus infection and acquired immune deficiency syndrome. Before ascertaining such factors, the limitations and concerns associated with the teaching and learning of the learners in question had to be established. The research problem is narrowed down to eight sub-questions in order to establish possible solutions. These sub-questions can be categorised as follows:

- Pressures on South African distance higher education institutions, and Internet and computer technology as a solution
- Interface design
- Web usability
- Utilization of a combination of media and technology

The study addresses each sub-question by means of an analysis of the published literature, by analysing how the findings of the project shed light on each research sub-question, and how each sub-question illuminated (in a wider sense) the remaining sub-questions, and the research question in general.

The answers to the research sub-questions will permit the researcher to determine how the teaching of adult learners from previously disadvantaged communities in the field of nutrition and HIV and AIDS could be made more effective by utilizing a distance education course that comprises a combination of media and technologies. This will then in turn lead to the formulation of strategies and guidelines for the design, development and implementation of e-learning as part a combination

of media and technology in order to offer effective postgraduate distance education courses for developing countries.

The results of the study could lead to the following possible applications:

- A post-graduate distance education course comprising a combination of media and technology
- A flexible, self-paced distance education course
- An interactive learning website
- Instant access to learning content
- Offering authentic and reliable information
- An *alternative* medium of offering content

Key words:

constraints; distance education; e-learning; HIV and AIDS; interface design; learning website; media; nutrition; technology; web usability.

Table of Contents

Chapter 1: Overview and orientation

Chapter 2: Literature review

Chapter 3: Research project – The learning website

Chapter 4: Research results

Chapter 5: Conclusion and recommendations

List of Figures

List of Tables

CHAPTER 1

Overview and orientation

1.1 Introduction

This thesis reports on a study conducted to investigate the design, development and implementation of a learning website as part of a distance education course comprising a combination of media and technology. The website functions as a tool for teaching distance education postgraduate adult learners mostly from previously disadvantaged communities whatever knowledge of nutrition they need to manage the symptoms and general health of people living with human immunodeficiency virus infection and acquired immune deficiency syndrome (HIV and AIDS). The study investigated factors that could serve as strategies and guidelines for the design, development and implementation of e-learning as part of effective postgraduate distance education courses for developing countries. Before ascertaining such factors, the limitations and concerns associated with the teaching and learning of the learners in question had to be established.

The course included:

- Printed study material
- An learning website
- Communication channels such as e-mail, telephone and facsimile
- Contact sessions: face-to-face and video conferencing

The learning website will be utilised primarily as a training tool for a nutrition and HIV and AIDS distance education course comprising a combination of media and technology. The website can also be used in face-to-face contact sessions and as a short course.

Results from the study were intended to lead to the integration of appropriate media and technology into the distance education Social Behavioural Studies in HIV and AIDS Honours Programme offered at VUDEC (Visa University Distance Education Campus). Before the completion of this study Vista University was incorporated into the University of South Africa, and further developments were put on hold.

1.2 Background

There are "… complex changes in patterns of health, disease, and mortality that result form demographic and associated economic and societal changes in a

world population that is getting older. In South Africa, however, as in many other developing countries, the African population is experiencing rapid urbanisation characterized a double burden of disease in which noncommunicable diseases become more prevalent and infectious diseases remain undefeated." (Vorster et al, 1999:341.)

HIV and AIDS can be described as the most shattering of these undefeated infectious diseases. The HIV and AIDS pandemic is exerting increasingly devastating socio-economic effects on South Africa and many other African countries (Piwoz & Preble, 2000:9; Steenkamp, 2000:130). For years the focus on the management of HIV and AIDS was on drugs – while the relationship between nutrition and HIV and AIDS was largely ignored. The World Health Organisation (WHO) has now highlighted the important role that nutrition plays in the management of HIV and AIDS (FAO Newsroom, 2003: [Online]). In countries where poverty is severe, where malnutrition and its side effects are commonplace, and where resources, healthcare and drug therapy is expensive and not readily available or unavailable, it is increasingly widely recognised that diet and nutrition can play an important role in the health management of PLWHA (people living with HIV and AIDS) (FAO Newsroom, 2003: [Online]; Huber et al., 2000:30; Kraak, 1995:476; Steenkamp, 2000:130). Thus, for example, malnutrition and weight loss (two of the most common conditions associated with this chronic disease) have critical implications for patient treatment, the risk of developing complications, quality of life, and prospects for survival (Hyman & Kaufman, 1989:521; McMahon, 1997:31).

As increasingly effective therapies have been introduced, the life expectancy of HIV and AIDS patients has increased. This necessarily forces us to reconceptualise our understanding of HIV as a chronic disease process. Patient care is now mostly directed at health maintenance, symptom management and disease prevention (Huber et al., 2000:30; Piwoz & Preble, 2000:29). "Diet and nutrition is directly involved in patient care protocols that reflect this focus on quality of life and expanded life trajectories" (Huber et al., 2000:30).

As the HIV and AIDS pandemic grows, so has amongst others, the need for nutritional care and support. Veldman (2002:S4) states: "…nutritional care and support is and essential component of health care management for people with HIV/AIDS". To provide nutrition counselling and support to PLWHA, workers and caregivers need to be trained in the field of nutrition and HIV and AIDS. Under such circumstances, it seemed appropriate to create a distance education course that would meet the needs of the target population who are unavailable during working hours because they themselves work during the day and/or because they live in remote rural areas. Distance education is increasingly becoming the preferred mode of learning for many learners. There is a growing need and appreciation among prospective learners, especially working adults with families, for the greater flexibility and the fewer time constraints that distance education courses offer (Carnevale & Olsen, 2003:A31; Dyrud & Worley, 2001:80; Schrum, 2002:6).

In 1998 the Sociology Department at VUDEC proposed the development of a diploma qualification in HIV and AIDS management in the workplace and the establishment of community projects related to the qualification. After this initiative, a wider interest in a learning programme in Social Studies and HIV and AIDS developed in the university. In 1999 a proposal was submitted to the University management for the development of a postgraduate qualification in Social Behavioural Studies and HIV and AIDS. Staff from the Sociology Department at VUDEC initiated consultations with various other departments at VUDEC and an NGO (non-governmental organisation) to establish an interdisciplinary working group in Social Behavioural Studies and HIV and AIDS. In 2000 the development of the honours degree programme in Social Behavioural Studies and HIV and AIDS began in all earnest. The first learners enrolled for the degree in 2001. The degree has attracted strong interest and the number of learners enrolling for the degree has increased by approximately 15 percent since 2001. But because of staff constraints and the extra teaching load that the facilitators of the course were required to bear, first-time learner enrolments had to be limited to sixty learners per year.

The purpose of the degree programme as a whole is to provide the learner with whatever skills and knowledge are necessary to understand and cope with the social behaviour aspects of HIV and AIDS. This in turn would lead to a reduction in the socio-economic impacts of HIV and AIDS. The degree programme is both integrated and interdisciplinary, and includes subject areas such as the social behavioural aspects of HIV and AIDS, supportive counselling, social behavioural research in HIV and AIDS, social responses to HIV and AIDS, nutrition and HIV and AIDS, and religion and HIV and AIDS. All the courses offered in the degree programme are outcomes-based and learners are evaluated by means of assignments (referred to in the programme as assessments) comprising theoretical questions, practice-based questions, and skills-development exercises. There are no formal examinations.

When the degree was being designed, those concerned with its development identified a need for a course that would focus on the nutritional needs of PLWHA. Since very few of the learners who enrol for the degree have any relevant nutritional knowledge, the course first had to familiarise learners with the basic facts of human nutrition before it could proceed to focus on the specific nutritional needs of PLWHA. This led to another question: What methods should be used to convey to learners the basic facts of human nutrition? Because of the peculiarities of the distance education mode of learning and the requirements of the stated outcomes of the course, and staff constraints learners had to acquire this basic knowledge of nutrition by means of self-study and at their own pace. Since the paper-based mode of offering the course has shown to be inadequate, alternative modes for conveying information were required.

For many years, distance education programmes have offered correspondence courses that rely mainly on paper-based study materials, the post, telephone calls, and, in some cases, television. The quality of interaction between lecturers and learners depended on (and was limited by) the

capacity and format of study material, assignments and telephone contact. With the advent of the Internet and e-mail, online education grew dramatically and began to provide alternative modes of delivering course content (Fender, 1999:26).

In the light of the needs that were identified and findings from the literature, it was decided to explore to what extent e-learning can be used as (1) a mode for delivering information and knowledge to learners from previously disadvantaged communities about the basic concepts of human nutrition and nutrition and HIV and AIDS − as a support for the paper-based mode of distance education at VUDEC, (2) providing an interactive and more pleasant learning experience while encouraging self-directed exploration knowledge formation and (3) provide instant access to learning content after registration.

It soon became apparent that because of the diverse backgrounds of the learners enrolled for this degree and their different circumstances (many are from previously disadvantaged communities), the other courses offered in this degree programme could also benefit from e-learning to complement their existing study material. Since the development of the e-learning nutrition course was already in progress, the developers decided (1) to use this course as a prototype for e-learning in the Social Behavioural Studies in HIV and AIDS Honours Programme, and (2) to establish the characteristics and criteria e-learning courses have to adhere to if they are successfully to accommodate the needs of learners in this specific target group.

In March 2001, the Minister of Education, Professor Kader Asmal, announced the National Plan for Higher Education. One of the proposals in the plan was that VUDEC would be incorporated into Unisa (University of South Africa) on 1 January 2004. Unisa and TSA (Technikon South Africa) would merge on 2 January 2004. The incorporation of VUDEC implied that all the departments at VUDEC would be incorporated into their corresponding departments at Unisa and that VUDEC courses would be phased out. Departments and/or programmes unique to VUDEC would therefore be offered as part of the Unisa curriculum. The Department of Consumer Science (that offered Nutrition) and The Social Behavioural Studies in HIV and AIDS Honours Programme were both unique to VUDEC.

1.3   Rationale for the study

The rationale for this study is based on (1) what needs to be done to 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) 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.

1.3.1   Need for research

❑   **Practical needs**

Public nutrition has been described as "…incorporating the social science perspective and applied, operational approach to research and education in nutrition. Public nutrition involves the integration of certain specific elements of a range of disciplines, but not all aspects of any one of them." (Rogers, 1998:7.)

Rogers (1998:12), in her keynote address on Public nutrition, stated: "Programs could be developed to provide Public nutrition training for professionals from other fields whose work is taking them in the direction of work on nutrition problems." Rogers also indicated that there is a need in Public Nutrition Education to develop and disseminate training materials that include text, other types of materials and current communication technologies (Rogers, 1998:10-12). One of the objectives of the course on nutrition and HIV and AIDS is to provide just such a basic nutrition distance education course that comprises a combination of media and technology to first-degree graduates (or those with other relevant qualifications) from fields such as Social Science, Education and Nursing.

It has been indicated that there are no postgraduate level courses available in applied and/or community nutrition at any of the South African universities (Oniang'o, 1998:25). Prior to this study, neither Vista University nor Unisa had offered such courses by means of distance education. Oniang'o (1998:24 and 25) recommended that courses in applied and/or community nutrition, offered by means of distance education, should be developed. She also suggested that these courses should cater for first degree graduates in a number of fields including, among others, Social Sciences, Education, Nursing, Economics and Medicine.

There is also a need to provide in-service nutrition training for numerous people already working within communities. Such people are in positions in which they need nutrition knowledge but do not have it (Oniang'o, 1998:24). Because people who work in rural communities are often closely involved in the day-to-day life of the community, they are often in the best position to detect early signs of malnutrition and other health problems. With proper training, they would be able to identify problems and conditions and make suggestions about the short-term management of the condition or problem before referring the person concerned to the appropriate health professional for treatment.

In the HIV and AIDS field, community workers with basic nutrition knowledge can offer valuable information to people with no or misguided nutrition knowledge. By changing people's perceptions about food, by explaining scientifically sound dietary practices to their communities, and by assisting them to change their eating behaviour, community workers can make a valuable contribution towards improving the health and well-being of PLWHA.

The social, behavioural, psychological, economic and political aspects of HIV and AIDS are addressed by other courses offered in the degree programme and are beyond the scope of this study.

❑   **Theoretical needs**

A preliminary literature search indicated that a small number of international e-learning nutrition courses are available on the Internet, although the quality of these courses is not known (Attström & Larsson, 2002:S5). In spite of the opportunities and challenges that the www (World Wide Web) provides for delivering nutrition education, it appears that information technology (IT) is still underutilized in this field (Kolasa, 2002:S9). Nutrition educators in developing countries are only now beginning to utilize online applications (Sigot, 2002:S23). Although it is acknowledged that the teaching of nutrition depends on interdisciplinary approaches, and that IT can serve as a tool to integrate it into various medical disciplines (Attström & Larsson, 2002:S5), limited research was available that investigates the integration of basic nutrition and health education into other non-medical disciplines at post-graduate level. No research could be found on e-learning, especially on the (www), that had either investigated or described the relationship between public nutrition and HIV and AIDS education offered by means of distance education. The available tertiary level courses are mostly designed for medical and dietetic learners where it complements the formal instruction.

Most of the research dealing with nutrition education at tertiary level covers issues relating to the teaching of clinical nutrition and the use of computer-assisted learning (CAL) and computer-assisted instruction (CAI) where it complements the formal instruction and teaching of nutrition learners. In a small number of instances, distance education is mentioned (Ogle, 2002:S10; Shah, George & Himburg, 1999:[Online]; Wenhold, Wolmarans & Nordhoff, 2002:S17).

1.4   Research problem and questions

This study is concerned with the factors and constraints that need to be considered when utilising e-leaning and the Internet to train learners in the field of nutrition and HIV and AIDS, and with devising possible solutions – with special reference to the implications of implementing a learning website and introducing other media and technologies to support the paper-based course in a way that will meet the needs of distance education adult learners from developing countries.

The main research question is:

What factors and constraints need to be considered when designing, developing and implementing a distance education course comprising a combination of media and technologies for the effective teaching of nutrition and HIV and AIDS at a South African distance education university?

A number of sub-questions emerging from the central problem needed to be addressed. The categories and questions are tabulated in Table 1.1 below.

Table 1.1: Research Questions

Issue	Question
Pressures on South African distance higher education institutions, and Internet and computer technology as a solution	**Question 1** What pressures are put on South African distance higher education institutions to provide postgraduate flexible learning to adult learners from previously disadvantaged communities? **Question 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? **Question 3** What constraints hinder the utilization of e-learning and the Internet in the distance education nutrition and HIV and AIDS course?
Interface design	**Question 4** What interface design principles would best facilitate the communication of nutrition and HIV and AIDS knowledge to adult learners from previously disadvantaged communities?
Web usability	**Question 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?
Utilisation of a combination of media and technology	**Question 6** What theoretical perspectives and adult learner perceptions play a role in the acceptance and utilisation of the Internet and e-learning as training tools? **Question 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? **Question 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?

Table 1.1 listed the eight sub-questions that emerged from the central problem.

A number of hypotheses concerning the central problem were formulated and needed to be tested. The categories and hypotheses are tabulated Table 1.2 below.

Table 1.2: Research hypotheses

Issue	Null-Hypothesis
Internet and computer technology	• There is no difference in the proportion of learners 29 years and younger who view themselves as computer literate when compared with the proportion of learners who are 30 years and older. • There is no difference in the proportion of male learners who view themselves as computer literate when compared with the proportion of female learners. • Fifty per cent of the learners viewed themselves as computer literate.
Interface design	• Fifty per cent or less of the learners found the visual presentation of the screen display acceptable. • Fifty per cent or less of the learners found the font size readable and acceptable. • Fifty per cent or less of the learners found the graphics effective and clarified the content.
Web usability	• Fifty per cent or less of the learners found the learning website user friendly and easy. • Fifty per cent or less of the learners felt that the learning website will assist them in improving the quality of their work. • Fifty per cent or less of the learners enjoyed working with the learning website.

Table 1.2 listed the hypotheses that were formulated concerning the study.

1.5   Research approach

In this study descriptive quantitative statistics supported by qualitative techniques were used to gather data.

1.5.1   Literature review

A review and analysis of the available literature formed a foundation for the research. The first section of the research was qualitative in nature, and its purpose was to establish what factors and constraints e-learning and the Internet possess as a distance education medium. Further analysis

will make it possible to establish what factors need to be considered when designing and implementing a learning website as part of a course that uses a combination of media and technology for the education and training of postgraduate distance higher education learners (from previously disadvantaged communities) in nutrition and HIV and AIDS.

1.5.2   Data collecting methods

The empirical component of the research consisted of developing and testing a distance education course that comprised a combination of media and technologies for the teaching of higher education learners in nutrition and HIV and AIDS. The process included, for example, the testing of certain components from the course with distance education learners. The evaluation took the form of questionnaires, interviews and discussions with learners and peers and the observation of learners' verbalised thoughts and actions.

Table 1.3 lists the research instruments used for the study and the description of each. The research questions were investigated by using literature, questionnaires, interviews and discussion, usability testing and expert reviews as data-gathering instruments.

Table 1.3: Research instruments used for this study (adapted form Reeves, 1994)

Research instrument	Description
Literature	Review and analysis of relevant journal articles, books and electronic documentation
Questionnaires	Collecting data on learner background and computer/Internet literacy
Interviews and discussions	Collecting data on learners' experiences of using a combination of media and technology in a distance education course Suggestions made by learners and peers on improving the website
Usability testing	Using the learning website
Expert reviews	Collecting expert views on the use of e-learning in distance education

Table 1.3 listed the research instruments used for this study. A short description was given on how each of the instruments was used to collect data.

Table 1.4 on the next page gives the evaluation matrix of the research questions. It lists the research questions with indications as to what research instrument was used to evaluate each question.

Table 1.4: Research questions evaluation matrix (adapted form Reeves, 1994)

Question	Review and analysis of literature	Question-naires	Interviews and discussions	Usability testing	Expert reviews
Question 1: What pressures are put on South African distance higher education institutions to provide postgraduate flexible learning to adult learners from previously disadvantaged communities?	✓		✓		✓
Question 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?	✓		✓		✓
Question 3: What constraints hinder the utilization of e-learning and the Internet in the distance education nutrition and HIV and AIDS course?	✓		✓		✓
Question 4: What interface design principles would best facilitate the communication of nutrition and HIV and AIDS knowledge to adult learners from previously disadvantaged communities?	✓	✓	✓	✓	✓
Question 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?	✓	✓	✓	✓	✓
Question 6: What theoretical perspectives and adult learner perceptions play a role in the acceptance and utilisation of the Internet and e-learning and as training tools?	✓		✓		
Question 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?	✓	✓	✓		✓
Question 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?	✓	✓	✓	✓	✓

1.5.3   Subjects of the study

The subjects of the study consisted of all the voluntary learners enrolled for the Social Behavioural Studies in HIV and AIDS Honours Programme. The course content comprises the role of nutrition in the management of the health and well-being of PLWHA.

1.5.4   Limitations of the study

The following limitations of the study should be taken into consideration:

- The study focused only on a postgraduate distance education course in nutrition and HIV and AIDS.
- The affective implications of HIV and AIDS and other factors related to HIV and AIDS were not addressed because they are beyond the scope of this study.
- The development of the learning website was limited by technological constraints.
- The study was limited to learners enrolled for the honours degree programme in Social Behavioural Studies and HIV and AIDS.
- English was used as medium of instruction. But since English is the second language for most of the learners, this might have had a limiting effect on the usability of the website and the interpretation of course content.
- Most learners had limited access to computers and the Internet.

1.6   Significance of the research

The results of the research should be significant in the following ways:

It identifies the factors and constraints that need to be considered when designing and implementing a learning website as part of a combination of media and technology for an interactive self-paced distance education course for use in developing countries.

It identifies the suitability of e-learning and the Internet as appropriate tools in a course using a combination of media for teaching learners in the field of nutrition and HIV and AIDS, or it provides evidence that e-learning and the Internet are not appropriate tools in a course using a combination of media for training learners in the field of nutrition and HIV and AIDS.

It provides strategies and general guidelines for the design, development and implementation of a learning website and e-learning as part of an interactive, self-paced distance education course comprising a combination of media, for use in developing countries.

It provides a basis for further research into the application of e-learning and other media and technologies as part of an interactive, self-paced distance education courses aimed at teaching learners from developing countries.

It contributes to the accumulated research into the relationship between design, information, the Internet, computer technology – and the training and teaching of learners by means of distance education in developing countries.

1.6.1   Structure of the thesis

Table 1.5 on the next page gives an outline of the structure of the thesis. It lists the chapters and gives a synopsis of the content of each chapter.

Table 1.5: Structure of the thesis

Chapters	Content
Chapter 1 Overview and orientation	Introduction Background Rationale for the study Research problem and questions Research approach Significance of the research
Chapter 2 Review and analysis of the literature	A review and critical analysis of findings from reported research on each of the research questions
Chapter 3 Project description: The learning website	Project description Design, development and implementation of the learning website Formative and summative evaluation of learning website and course
Chapter 4 Research results	Questionnaire A: Learner profile Questionnaire B: Formative evaluation of learning website Questionnaire C: Summative evaluation of learning website Hypothesis
Chapter 5 Conclusion and recommendations	Findings and results collected from the research Discussion Scientific reflection Recommendation Conclusion

1.7   Summary

This chapter has provided a framework for the study. It presented overviews on the application of e-learning and the Internet as part of a postgraduate distance education course to teach learners from developing countries and the implementation of these modalities in a course on nutrition and HIV and AIDS. Research questions that reflected the aims of this study were formulated. Chapter 2 reports on a review and analysis of the literature in an attempt to find answers to the research questions and to situate this research in its relevant theoretical and historical context.

CHAPTER 2

Literature review

2.1   Introduction

The purpose of the literature review was to determine what factors and constraints I (the researcher) needed to consider when selecting a combination of media and technology that would produce an effective postgraduate distance education course in nutrition and HIV and AIDS. In order to identify these factors, the advantages and constraints or limitations that are associated with a number of media especially the Internet (and e-learning, which depends on it), had to be established. The analysis therefore served the purpose of enabling me to identify the constraints and challenges involved in the distance education of postgraduate learners from previously disadvantaged communities in nutrition and HIV and AIDS and to focus on those specific aspects in the next part of the study.

The research questions as they were formulated in chapter 1 were addressed. As far as it is appropriate and possible, the questions are investigated within:

- An international context
- A national context
- An institutional context

Literature for the study was selected from a wide range of national and international academic journals in the traditional printed format and from electronic databases. I also consulted Internet publications from authors and companies with sound reputations in their fields. A number of the references in the text refer to *Online* sources because these documents are published in HTML (Hypertext Markup Language) format and do not have defined pages or page numbers.

2.2   Analysis of reported research per research question

In the following subsections an analysis of the reported research pertaining to each research question is discussed.

2.2.1   Pressures on distance higher education

> **Research Question 1**
>
> What pressures are put on South African distance higher education institutions to provide postgraduate flexible learning to adult learners from previously disadvantaged communities?

The distance learning landscape in Africa is transforming at a rapid pace and it is driven by diverse economic, technological and social trends. Probably the most important of all these trends is the enormous demand for access to quality higher education (Norman, 2004:1; Van Brakel & Chisenga 2003:485). South African distant education institutions are also experiencing the pressures created by this demand and by the increasing desire for flexible, postgraduate distance education for adult learners from previously disadvantaged communities. This study is limited to examining the challenges and constraints related to the delivery of an effective distance education course in nutrition and HIV and AIDS to adult learners from previously disadvantaged communities and how to meet the needs of the target group. Other issues relevant to distance education in South Africa are beyond the scope of this study.

Within the modern context of rapid global economic and technological changes, and highly competitive and shifting market conditions, there is an urgent need to reskill workers (Vaas 2001:[Online]; Wills 2003:[Online]). "Increasingly, businesses are moving from a manufacturing base to a service base − and service businesses are information-based. The new jobs created by service-oriented economies require higher levels of skill, increased flexibility and an increased ability to deal with change. This substantially increases the need for training and retraining" (Steed, 1999:6).

According to Steed (1999:6), the need for change in education delivery is driven by:
- Increased demands for education.
- The growing disparity in skills.
- Acceleration in the rate of technological change.
- Greater demands for increased productivity.
- A reduction in the amount of time available for training.
- The need for effective innovations in on-demand training and learning

In South Africa, as in other countries, the education system is currently challenged by an increasing demand for alternative means of education, and it is evident from the literature that higher education institutions are progressively incorporating information communication technologies and distance education to increase access and meet adult learners learning needs within the framework of life-long learning (Charp, 2003:8; Bosse, 2003:[Online]; Grooms, 2003:[Online]; Abouchedid & Eid, 2004:15; Ally, 2004:5; Ngokha & Heydenrych, 2004: 23; Zentel et al, 2004:237).

Anderson and Elloumi express the following opinion about the benefits of education:

> We believe that education is one of the few sustainable means to equip humans around the globe with skills and resources to confront the challenges of ignorance, poverty, war, and environmental degradation. Distance education is perhaps the most powerful means of extending this resource and making it accessible to all (Anderson & Elloumi 2004:16).

But what are the features of distance education that makes it more appropriate to fulfil these demands? Table 2.1 below gives descriptions of distance education and its features.

Table 2.1: Descriptions of distance education

Description	Reference
"Distance education is planned learning that normally occurs in a different place from teaching and as a result requires special techniques of course design, special instructional techniques, special methods of communication by electronic and other technology, as well as special organizational and administrative arrangements".	Moore & Kearsley, 1995:2
"At its most basic level, distance education takes place when a teacher and student(s) are separated by physical distance, and technology (i.e. voice, video, data, and print), often in concert with face-to-face communication, is used to bridge the instructional gap."	Wills, 2003:[Online]
"Teacher and student are physically separated during a major part of the distance learning process. Today, however, *distance learning* may be better defined as education in which teacher and student, while physically separated, are intellectually connected via technology."	Burke & Slavin, 2000:[Online]

Table 2.1 gave descriptions of what some authors termed as "distance education".

From the descriptions of distance education given in Table 2.1 there are three key elements that distinguish distance education from traditional face-to-face education. These elements are separation, media and communication. Table 2.2 on the next page gives a description of each of these elements.

Table 2.2: Elements that define distance education (Adapted from Steiner, 1995:[Online])

Elements	Description
Separation	Facilitator and learner are usually spatially separated during the greater part (or during the whole of) of each instructional process.
Instructional delivery	Educational media are the means used to transfer course content and facilitate the link between facilitator and learner.
Communication	A two-way communication process is provided between facilitator and educational institute, and the learner.

Table 2.2 listed the elements of distance education and gave a description of each element.

The most important role-players in the demand for more flexible and effective education are the learners themselves. Their needs and requirements have contributed to an increased shift to distance education (Anon, 2001:[Online]). Since the 1970s, there has been a noticeable change in the profile of learners − as well as in the patterns of when and where they learn (Twigg, 1994:[Online]). Changes in learner identity and learning patterns necessarily challenge higher education institutions to rethink their views and assumptions about the teaching and learning experience and reconceptualise their profile of their learner population (Wyatt, 1997:[Online]). The new majority of distance university learners or non-traditional learners nowadays are adults older than 25, non-residential, working full- or part-time and studying part-time. (In the study the term "adult learner" will refer to this description). Many of them will also have family commitments (Blustain et al., 1999:58; Hijazi, 2003:35; Mulligan & Geary: 1999:[Online]; Sakamoto, 2003:400). A large number of these learners are females with children. They are also often single parents and (for various reasons) cannot attend face-to-face instruction (Carnevale & Olsen, 2003:[Online]; ITC's Definition of Distance Education, 2003:[Online]). Another group of distance learners are those who do not have the money or educational background to attend residential institutions or those who are physical disabled and are unable to travel (ITC's Definition of Distance Education, 2003:[Online]). The fastest growing sector in higher education consists of learners in this category (Worley, 2000:[Online]). Ultimately, the ability of universities to adapt to new conditions is challenged by the changing nature of the learner body (Daniel, 1996:7). There are a number of researchers that are of the view that distance education and e-learning may be a more appropriate way of delivering education to groups of learners who come from different ethnic backgrounds, and whose needs and expectations, prior education and life experience, personal learning styles and abilities vary considerably (Mutula, 2002:99; Beller & Or, 2003:24).

The *industrial age* model for education is being replaced by a new paradigm of learning for the 21st century. This paradigm or vision is fundamentally realigned with the needs of learners in an *information age*. The educational environment is undergoing a technology-driven shift of unparalleled proportions (Sangster & Lymer, 1998:[Online]). Learner demands are shifting from the current *just-in-case* education, where learners are expected to complete degree programmes long

before they actually need the knowledge, to *just-in-time* education, where learners seek education *when* they need it, often through non-degree programmes, and to *just-for-you* education, where educational programs are tailored-made to meet the particular and well-defined lifelong learning needs of learners.

According to a marketing study, learners are looking for certain features in distance education (DiPaolo, No date:[Online]). Table 2.3 below lists the needs and wants learners identified; they include delivery options, course design, delivery, teaching approach, presentation, course format, interaction and support.

Table 2.3: What learners need and want from distance education (Adapted from DiPaolo, No date:[Online])

Need	Description
Delivery options	Real-time and time-delay options
Course design	Well-designed, engaging, and intellectually challenging courses
Delivery	Seamless, available, and reliable delivery technology
Teaching approach	A greater emphasis on learner-centred as opposed to teacher-centred approaches
Presentation	A high level of interaction, including problem-based simulation
Course format	Modularised formats instead of courses that demand large chunks of time
Interaction	Participation in the learning community through interaction with instructor and fellow students
Support	Academic advisory and student support services that are convenient and easy to understand and access

Table 2.3 listed what learners need and want from distance education. The main features they identified are the option between real-time and time-delay delivery that should also be reliable and seamless. The course should be well designed, interactive and challenging while providing adequate support services.

Adult learners expect universities to conform to their time constraints and to offer courses that are more accessible than those offered on conventional campuses (Carnevale & Olsen, 2003:[Online]). Learners, and, in particular, adult learners, display a consumerist approach which in future will make them the institution's most formidable customer group. They will (typically) consider several service-providers before choosing who might best accommodate their personal and professional needs (Boettcher, 1999:[Online]; Katz, 1999:40; Carnevale & Olsen, 2003:[Online]). The "one-text/one-test/one-delivery-mode-fits-all" mode of instruction is rapidly losing its appeal (Kember & Gow,

1994:67). These learners will have high expectations and their learning resources will have to be efficient. In future, if education and training courses "need to be well designed, offering effective learning experiences with predictable outcomes in less time" (Boettcher, 1999:[Online]).

Higher education institutions ignore the significance of this new consumer-orientated group of adult learners at their peril because, if they are not satisfied, they will simply withdraw their support from the institution that does not meet their expectations (West, 1999:16). In the process, they will make their views known and their dissatisfaction will spread to other groups of potential learners, financial supporters and policymakers (Rowjan, Lujan & Dolence, 1998:146).

As the market for university services expands, so does competition in the form of a proliferation of virtual universities and *learning-ware* providers by new facilitators, learning agents and intermediaries (Duderstadt, 1999:6). While such new providers intensify competition, they also offer many more choices and opportunities for learners (Sangster & Lymer, 1998:[Online]; Duderstadt, 1999:10). Higher education institutions that respond to the challenge of competition and that accommodate the needs of a changing society by harmonising their practices with the innovations that characterise the information age, gain advantages over their less innovative competitors. Those institutions that do not take account changing times and practices, place them at risk of being superseded by their more far-sighted competitors (Dolence & Norris, 1995:[Online]; Duderstadt, 1999:1).

 Likewise, there is a shift from synchronous, classroom-based instruction to asynchronous, computer network-based learning in which learners plan their own study schedule (Wyatt, 1997:[Online]; Duderstadt, 1999:4). These practices will be able to provide widespread learning opportunities throughout society. However, both shifts demand major changes in academia (Duderstadt, 1999:4).

Distance education institutions have to be able to satisfy their learners' demands for up-to-date skills and subject matter expertise because they have to survive in competitive workplaces and undertake multiple career changes during the course of their lifetimes. It therefore follows that the most successful people in the work place have to be skilful and motivated *life-long learners* because their employers expect them to be partners in increasing productivity, lowering costs and remaining on the competitive edge in their fields (Worley, 2000:[Online]). In order to remain competitive, workers continually need to expand their knowledge base and skills. This means in effect that they must be constantly in search of the best new education opportunities (Worley, 2000:[Online]; Blustain et al., 1999:56; Boettcher, 1999:[Online]; Daniel, 1996:7). The objectives of higher education institutions should be extended in order to encompass these demands (Blustain et al., 1999:56). Distance education, by utilizing the Internet and its related technologies, is uniquely well placed to meet these demands and provide higher education because it can reach and satisfy the needs of those who are disadvantaged by limited time, distance or physical disability (Worley, 2000:[Online]; Cloete, 2001: 172; Wills, 2003:[Online]).

There is in South Africa an increasing pressure on graduates (both workers and the unemployed) to continue to acquire university-level understanding and knowledge or to reskill themselves. In order to achieve this, most people need more accessible and flexible educational programmes that will meet their particular learning needs. South African distance higher education institutions (from 2004 there is only one, namely the "New Unisa") are in a position to provide relevant, on-demand training and education. One of the aims of the honours degree programme as well as the nutrition and HIV and AIDS course is to take cognisance of learners' demands for subject matter expertise and up-to-date skills. We aim to respond to the challenges mentioned above by harmonising our practices with the innovations that characterise the information age. If this does not happen, our learners may turn to other institutions to meet their needs.

Considering these educational pressures and the factors identified in the literature, the following issues that affect postgraduate adult learners from previously disadvantaged communities need to be addressed: (1) How can the postgraduate distance education course in nutrition and HIV and AIDS be designed to accommodate adult learner needs in respect of delivery options, course design, teaching approach, presentation, course format, interaction and support? (2) How can the postgraduate distance education course in nutrition and HIV and AIDS be designed and implemented so that learners get up-to-date and accurate information about nutrition and HIV and AIDS and so that they are all brought up to the same level of nutrition knowledge? (3) How can we guide learners to construct meaningful and relevant knowledge from the information they have so that they can apply their acquired nutrition knowledge in the communities they serve?

❑ **Conclusion**

The literature indicates that there is an increasing need for distance education as an alternative to the more traditional classroom-based instruction. In addition, constant changes and fluctuations in global economies and marketing conditions, not to mention a highly competitive job market and constant innovation in technology, create an ever-growing demand for skilled and reskilled workers. The accommodation of these demands devolves on the educational system. Distance education institutions are under increasing pressure to provide relevant, on-demand training and education – while at the same time accommodating a variety of learner profiles. A growing number of adult learners who work in full- or part-time occupations are turning to higher distance education institutions to provide them with more accessible and flexible educational programmes that will meet their particular and well-defined lifelong learning needs.

Higher distance education institutions can accommodate the needs and pressures of a changing society most effectively by providing synchronous, asynchronous, e-learning opportunities. These modes of learning will provide the needed learning opportunities throughout society and reach many who would be ineligible for traditional education because limitations imposed on them by time, distance, age, physical disability, economics, and various other social and personal circumstances.

This new technology offered higher education institutions distance learning opportunities at affordable prices, anywhere, to anyone, at anytime. No longer is education confined to a campus or an academic schedule (Duderstadt, 1999:5; West, 1999:17).

There is an increased demand for education in the United States that will be met almost entirely by means of e-learning (Beller and Or, 2003:23). I am of the view that e-learning will also play a significant role in providing future distant education for the masses in South Africa and beyond its borders, as long as the e-learning courses are structured in such a manner that they are effective and meet learner needs and accommodate the learner profile.

The next section will discuss the learning opportunities that the Internet and e-learning offer distance education.

2.2.2   Learning opportunities provided through the Internet and e-learning

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Research Question 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?

❑   **Background on the nutrition and HIV and AIDS course**

As the HIV and AIDS pandemic grows so does the demand for education in training in the field of HIV and AIDS. In 1999, the Sociology Department at VUDEC submitted a proposal to the University management for the development of a post-graduate qualification in Social Behavioural Studies and HIV and AIDS. Staff from the Sociology Department in consultation with various other departments at VUDEC and a NGO (non-governmental organisation) established an interdisciplinary working group and together they developed the *Social Behavioural Studies in HIV and AIDS Honours Programme*.

The purpose of the degree programme is to provide the necessary skills and knowledge on the social behaviour aspects of HIV and AIDS and to reduce the socio-economic impact of HIV and AIDS. It is an integrated and interdisciplinary degree programme offering outcomes-based courses where learners are evaluated by means of assignments (referred to in the programme as assessments) comprising theoretical questions, practice-based questions, and skills-development activities. There are no formal examinations. Courses offered in the programme include social behavioural aspects of HIV and AIDS, supportive counselling, social behavioural research in HIV and AIDS, social responses to HIV and AIDS, nutrition and HIV and AIDS and religion and HIV and AIDS.

When the degree was being designed, those concerned with its development identified a need for a course that would focus on the nutritional needs of PLWHA. The FAO (No date:[Online]) states that people, especially people in rural areas, have little access to information and are therefore ignorant about how to protect themselves from HIV and how to take care of those who do fall ill. "…Nutritional care and support is and essential component of health care management for people with HIV/AIDS." (Veldman, 2002:S4). Rogers (1998:12), in her keynote address on Public Nutrition, stated: "Programs could be developed to provide Public Nutrition training for professionals from other fields whose work is taking them in the direction of work on nutrition problems." Public Nutrition is described as "…incorporating the social science perspective and applied, operational approach to research and education in nutrition" (Rogers, 1998:17). Oniang'o (1998:24 and 25) recommended that courses in applied and/or community nutrition, offered by means of distance education, should be developed. She also suggested that these courses should cater for first degree graduates in a number of fields including, among others, social sciences, education, nursing, economics and medicine. Rogers (1998:10 and 12) also indicated that there is a need in Public Nutrition education to develop and disseminate training materials that include text, other types of materials and current communication technologies. One of the objectives of the course on nutrition and HIV and AIDS is to provide just such a basic nutrition distance education course that comprises a combination of media and technology for first degree (or relevant qualification) graduates from fields such as Social Science, Education and Nursing. Many of these learners come from previously disadvantaged communities in the rural areas of South Africa, and either have no knowledge at all about nutrition, or very limited knowledge, or knowledge that is scientifically insupportable.

Offering a postgraduate distance education course in nutrition and HIV and AIDS poses unique problems. The majority of learners who enrol for the nutrition and HIV and AIDS course have qualifications in the Social Sciences, Education, and Nursing from residential institutions. Although most learners possessed no formal qualifications in nutrition, I anticipated that they would possess at least some degree of reliable knowledge about nutrition. To provide learners with some basic points of reference in the science and practice of nutrition, I included in the first part of the initial, paper-based study guide an overview of basic nutrition. The remainder of the study guide focused on basic nutritional care, support to PLWHA, and some of the social implications of nutrition and HIV and AIDS. However, when the course was offered for the first time in 2001, it soon became apparent that the learners possessed even less basic nutrition knowledge than had been anticipated and that also (as individuals) possessed different levels of nutrition knowledge. They also entertained many misconceptions about nutrition in general and nutritional care and support for PLWHA. It thus became evident that the paper-based mode of presenting the nutrition and HIV and AIDS course would not meet the needs of these learners.

The paper-based course on nutrition and HIV and AIDS comprises a study guide and three "readings" (a reading is a compilation of sections from a text book or a number of text books and journal articles) that focus on nutrition and HIV and AIDS. Many textbooks on nutrition have only one

chapter on HIV and AIDS, and the very limited information that they do present takes little or no cognisance of the African context. If one takes into account the fact that most learners are from previously disadvantaged communities and the cost of overseas textbooks is prohibitively high (there are no local nutrition textbooks because only a small number of people major in nutrition), one cannot expect learners to buy three to four textbooks to get the information they require. To obviate this textbook problem, learners were provided with a selection of carefully selected readings that were extracted from reliable textbooks. The readings also included publications and reports that had a bearing on nutrition and HIV and AIDS in the African context, and textbook chapters on matters relevant to community nutrition. Because of the high costs of the paper format, more information about nutrition cannot be added to the existing readings, and the readings themselves need to be phased out and replaced with more relevant and alternative, less expensive modes.

The course therefore, first had to familiarise learners with the *true* facts of basic human nutrition before it could proceed to focus on the specific nutritional care and support of PLWHA. Because of the peculiarities of the distance education mode of learning and the requirements of the stated outcomes of the course, and staff constraints learners had to acquire this basic knowledge of nutrition by means of self-study and at their own pace. The questions then: what media and technology (excluding the paper format) would be most appropriate to convey the basic facts of human nutrition and nutrition and HIV and AIDS to learners and how should these methods be applied to guide learners in constructing their own meaningful and relevant knowledge?

❑   **Application of technology**

Does the application of technology truly add value to adult distance education? The question should rather focus on **how** and **for what purpose** technology adds value. How can available technology be implemented to do what was previously not possible, and how have peoples' perceptions changed with regard to what is important to know, and what a person is supposed to be able to do? These questions imply that the point of departure is not at technology per se, but rather at the content and curriculum of each course or learning experience. One should first establish the instructional goals and then only identify the most effective instructional tools available for one's purposes before one can achieve these goals (Ginsburg, 1999:13).

The application of technology does not change how people *learn*: it changes the way in which they can be *taught* (Horton, 2000:6). Technology should facilitate the learning process by providing more efficient ways of teaching (Cohen & Lippert, 1999:743). To ensure that factors such as the learners' computer skills and their degree of technical knowledge do not affect their success, the delivery platform should be "…easy to use, reliable and support learning" (Lindh & Soames, 2004:133). Merely translating classroom courses into e-learning courses presented by means of some or other technology without expecting learners to be actively involved and acquire new critical skills, methods

and modes of communication, is meaningless at best, and very expensive at worst (Schank, 1999:54).

E-learning has the potential to enhance and support communication and collaboration between individuals and in groups (Steed, 1999:1; Hills, 2000:33). E-learning minimizes the educational role of the teacher as being the sole source of knowledge and rather allows her to become a collaborator, mediator and facilitator in the learning process; it supports learners in developing process skills and building knowledge, rather than only gaining information and knowledge (Beller & Or, 2003:27; Kuboni, 1999:3). Technology has the potential to bridge the gap between educational disparities of race, income and region, and to deliver learning to adults on a scale hitherto undreamed of (Hopey, 1999:26). It can also "contribute to accountability by reinforcing learner-centred instruction and outcomes-based education while overall improving the relationship between teaching, learning, assessment, and effectiveness" (Hopey, 1999:26).

On of the aims of the degree programme (including the nutrition and HIV and AIDS course) is to guide learners in developing skills and methodologies that they need to engage in independent, life-long learning. Such competencies and foundation skills include:

- Interpersonal and communication skills, i.e. working with peers and teaching others
- Information skills, i.e. acquiring and evaluating data, interpreting and communicating
- Systems skills, i.e. understanding social, organizational, and technological systems
- Thinking skills such as critical thinking, thinking creatively, making decisions, solving problems, quantitative reasoning, knowing how to learn (Ginsburg, 1999:13; Mutula, 2002:105; Twigg, 1994:[Online]).

These skills cannot be learned in isolation: they have to be learned in a context where the skills concerned are valued, modelled, and assessed (Ginsburg, 1999:13-14). However, due to staff constraints, facilitator workload, time limitations and the physical distance between facilitator and learners, the facilitator needs tools to assist her in the teaching process. Technological applications (properly implemented and presented) can meet this need. The question is then, how can e-learning and the Internet be applied as teaching tools so that they add value to the nutrition and HIV and AIDS distance education course.

❑   What value can e-learning add to distance education?

The president and chief executive officer (CEO) of Cisco Systems, John Chambers, (2004:[Online]) made the following statement concerning the Internet and by implication e-learning: "I truly believe that the Internet and education are the two great equalizers in life, levelling the playing field for people, companies, and countries worldwide. By providing greater access to educational opportunities through the Internet, students are able to learn more." Various authors view e-learning

as a viable means of distributing and delivering educational material at distance and residential institutions (Geueke, & Stausberg, 2002:197; Beller & Or, 2003:24; Chan & Welebir, 2003:196; Katz, & Yablon, 2003:48 – 49; Rubenstein, 2003:28; van Brakel & Chisenga, 2003:478 -479). Some of the most important e‑learning features identified by these authors are:

- It gives more people access to education.
- It theoretically allows access to content anywhere and at any time.
- It permits convenient and flexible learning.
- Learners may study at their own pace.
- It gives access to the latest information worldwide.
- Its content is more interactive and engaging.
- Learners are not dependent on lecturers to deliver content.
- It reduces distribution costs.

E-learning can be described as using all electronic media and technologies, including the Internet, intranet, extranet, satellite broadcasts, audio/video tape, interactive television, CD-Rom and video conferencing, to delivery instructional content and to create, foster and facilitate learning experiences. Several phrases have been used to describe e-learning. They include "technology-based teaching" (TBT), "computer-aided learning" (CAL), "computer-based learning" (CBL), and "technology-enhanced learning" (TEL) (Govindasamy, 2002:288; Nichols, 2003:[Online]; Raab, *et al*., 2002 :221; Stewart & Wright, 2004:7 and 9). For the purpose of this study I will use the term "e-learning". As technology advances, the vocabulary that we use to describe techniques changes. But what remains fundamentally important is that learners *acquire* and *use* technology (usually in the form of personal computers that can be connected to the Internet) effectively to access information, alternative views and examples and acquire new skills (Brown, 2004:[Online]).

Table 2.4 on the next page lists of some of the concepts and features associated with e-learning namely e-learning, media, distance education, synchronous, asynchronous learning, and others that are not easily achieved in traditional teaching and learning formats.

Table 2.4: A description of some e-learning concepts and features (Driscoll & Reid 1999:73; Pantazis, 2002:[Online])

Concept	Description
E-learning	The phrase e-learning implies the use of "e" (electronic) means of learning and generally implies the use of diverse learning strategies and technologies to accumulate and transfer knowledge and information.
Media	E-learning is deemed to include, but is not limited to: • video and audio tapes • video and audio conferencing • electronic collaboration tools • radio and television programmes • CD-ROMs • online and other web-based learning • other computer-based learning resources • satellite technologies compatible with learning
Distance learning	E-learning can be viewed as part of the larger field of distance learning. Some regard e-learning as being *too remote*. However, e-learning can be a means of delivering distance education as part of a combination of media or can be used to supplement classroom activities.
Synchronous Asynchronous	E-learning materials can be delivered either: • synchronously – in real-time in a classroom or in a distance situation • asynchronously – with a time delay, at any suitable time
Others features	E-learning offers some other features that are not as easily achieved in traditional teaching and learning formats. They include: • high levels of interactivity • the possibility of personalizing learning material • repeatability

Table 2.4 shows that e-learning includes a variety of electronic media that can be used in combination with other media to increase the scope, range and effectiveness of distance learning or to supplement classroom activities. Interactive e-learning materials can be delivered synchronously or asynchronously and may also be used repeatedly – as and when required.

Driscoll and Reid (1999:73) are of the view that a more effective definition of e-learning should be based on *learning outcomes*. They have identified four types of e-learning that are characterised by goals, instructional strategies, and the roles of the instructor/facilitator and learner. They are synchronous and asynchronous learning, individual learning, and group learning (Driscoll & Reid 1999:73). Each of these four types of e-learning are summarised below.

- **Synchronous learning**

The word *synchronous* means "at the same time". Synchronous activities imply that geographically dispersed learners and/or facilitators participate together in some activity via the web at the same time. Such events are also termed *real-time* or *live* events. Synchronous activities include chat sessions, screen-sharing, timed testing periods, whiteboard sessions, audio and videoconference and other coordinated activities. Facilitators "broadcast" audio out to learners through a teleconference telephone call, or web-based audio. Learners watch a slideshow presentation from a web site "driven" by the facilitator. Learners ask questions or comment by telephone or through a chat window. The scheduling of these activities requires careful preparation and organisation. Synchronous training is generally used in academic programmes, such as continuing education programmes or higher distance education programmes (Boisvert, 2000:[Online]; Horton, 2000:55; Kruse, 2000c:[Online]).

Horton (2000:57) provides the following guidelines for when to select synchronous activities. Use synchronous activities when:

- learners need to discuss issues with other learners, facilitators/lecturers or experts at length
- learners need the motivation of scheduled events reinforced by peer pressure
- most learners share the same needs and have the same questions

- **Asynchronous learning**

The word *asynchronous* means "not at the same time". It is more commonly used since it creates a just-in-time, on-demand learning experience and offers complete flexibility. Such events amongst others include permanently posted web pages, listserves, e-mails and automatically scored tests. Asynchronous learning can be facilitated or self-paced.

The implication of asynchronous learning is that learners are free to access and complete e-leaning activities, without live interaction with the facilitator. It provides a common space for sharing opinions and solutions. Forums are built by participation. Beginning as an empty page, it develops as learners/facilitators submit questions, provide answers, solutions, or other opinions, share pointers to other resources, and post documents for downloading. Groups of learners work together to create shared libraries of information. Assignments include online reading or research. Learners communicate via online bulletin boards and submit their work via e-mail. A lot of interaction among peers and facilitators provides personalised input and guidance (Boisvert, 2000:[Online]; Horton, 2000:55; Kruse, 2000c:[Online]). Horton (2000:57) provides the following guidelines for when to select asynchronous activities. Use asynchronous activities when:

- learners come from a wide spectrum of time zones and countries
- learners have inflexible or unpredictable work schedules
- learners cannot wait for a class to form
- learners have unique individual needs

Courses need not be purely synchronous or asynchronous. Many courses consist of events and activities that are a mixture of both (Horton, 2000:56). Learners can then spend a number of hours per week participating in synchronous activities that provide the learners the opportunity to interaction with their peers and facilitator. This can alleviate the feeling of loneliness that distance education learners often experience. The asynchronous activities can then be completed at a time and place that suits the individual.

Synchronous and asynchronous learning are both suited for distance education. Considering the facilities available at VUDEC and the target population, (1) how much synchronous and asynchronous learning should be made available, and (2) in the case of synchronous learning, when and at what times will best suite al parities concerned?

- **Applications for individual learning**

Table 2.5 on the next page lists a number of e-learning concepts used in reference to individual learners namely the learning process, objectives, delivery mode, self-passed and self-scheduled, effective learning, testing and interactivity. A description of the concepts is given followed by a summary of the implication each of these concepts hold for the individual learner.

Table 2.5: Descriptions of e-learning concepts used in reference to individual learners (Adapted from Kilby, 1997:[Online]; Driscoll & Reid 1999:73)

Concept	Description	Implications
Learning process	E-learning takes advantage of the world of hypermedia. It allows users to take control of the learning process.	Learners proceed at their own pace and meet their self-directed study and learning needs.
Objectives	E-learning is designed around pre-determined and well-defined learning objectives.	The learner is able to meet the learning objectives.
Delivery mode	Asynchronous – most e-learning instructional elements are delivered in this manner. Synchronous – delivery of instructional elements	Learners set their own pace and direction. Other users need to be online at the same time. Pace and direction is set for the learner. Learners and/or facilitators are online at the same time.
Self-passed and self-scheduled	Although a large number of learners may be enrolled for the same programme, e-learning can be applied as individual instruction.	Learners study at their own pace and schedule. The pace, schedule and success of one individual has no bearing on that of the other learners.
Effective learning	E-learning tests the user's knowledge.	Determine how effective learning actually is.
Testing	Learners are tested throughout the learning process.	As a result of tests, the training may be adapted to the user's needs and even remedy deficiencies.
Interactivity	E-learning lessons can provide interactive exercises, scenarios, and simulations.	Learners interact with information presented in lessons while learning skills by applying knowledge in real-world activities. By making use of various forms of media, verbal, visual, and aural learners are helped equally.

Table 2.5 indicates how various e-learning concepts can be applied to individual learners. E-learning assists the individual learner to structure his or her own learning experience according to his or her individual needs and circumstances. Learners set their own pace and schedule independently of other learners. Learners are able to interact with the learning content and apply

their newly acquired knowledge to real-life situations. These features enrich distance education and make it a less solitary and impersonal mode of education.

Distance education and e-learning may also be a more appropriate way of delivering education to groups of learners who come from different ethnic backgrounds, and whose needs and expectations, prior education and life experience, personal learning styles and abilities vary considerably (Mutula, 2002:99; Beller & Or, 2003:24).

E-learning has the potential to make the distance education course in nutrition and HIV and AIDS more flexible, interactive and effective while at the same time providing as much information as the learners need. Even so, the following issues relevant to the course and adult learners from previously disadvantaged communities need to be addressed: (1) How can distance education and e-learning best be applied so that it accommodates learners from different ethnic backgrounds, and whose needs and expectations, prior education and life experience, personal learning styles and abilities vary considerably? (2) How can learners with limited access to computers and the Internet be accommodated in the course? (3) How can we use e-learning in the course to provide learners with all the information and knowledge they need, and how can we bring all learners up to the same level of nutrition knowledge? (4) How should e-learning be presented in the course so that learners become *interactively* involved with the information they receive? (5) How can e-learning be presented so that learners will be stimulated to construct their own knowledge and experiences of nutrition and HIV and AIDS? (6) What kind of e-learning assessment will enable learners to monitor their own progress in mastering the background knowledge about nutrition and HIV and AIDS? (7) How should the submission of assessment activities be structured so that learners can be given as much flexibility as possible to work within the limits of their personal constraints?

- **Applications for group activities**

Table 2.6 on the next page lists and describes the e-learning concepts used to describe group activities such as synchronous discussions, asynchronous discussions and collaboration. After that, I give an indication of what implications each of these concepts holds for group activities that take place during the learning event.

Table 2.6: Descriptions of e-learning concepts used in reference to group activities (Adapted form Kilby, 1997:[Online]; Hofstetter, 1998:88 & 95; Driscoll & Reid 1999:73)

Concept	Description	Implications
Synchronous discussions	Synchronous discussion is where two or more people interact in real-time over the Internet. These programs are very similar to audio and video conferencing.	The facilitator and learners schedule dates and times when they will have group discussions in real-time. Chat rooms and whiteboards are examples of synchronous discussion methods.
Asynchronous discussions	Asynchronous discussion is where two or more people interact in using e-mail protocols to distribute messages.	Facilitators and learners participate by posting messages to a list of users (listservs) or to an electronic bulletin board (newsgroups). Participants can converse on specific topics by means of the Internet.
Collaboration	E-learning can be used for teamwork. Learners work together to build team projects, solve case studies, and develop skills.	During these activities, students learn from each other. Collaboration can take place by means of synchronously or asynchronously activities.

Table 2.6 illustrated how the Internet and www provide unique ways of bringing learners together and creating academic communities. They provide innovative and interesting ways to engage in the learning process by incorporating the social and collaborative corollaries of education through technologies such as e-mail, listservs, newsgroups, discussion groups and synchronous chat rooms. In addition, with the improvement of web-enabled video and voice technologies, and with technology itself becoming less obtrusive, their even more extensive use in higher education is expected (Daniel, 1996:17; Milliron & Miles, 1999:[Online]).

In line with the views of Driscoll and Reid (1999:73) current educational theories according to Brush & Uden (2000:[Online]), make the following assumptions about learning:
- Learning is a process of knowledge construction.
- Learning is reflective and builds on the learner's existing knowledge.
- Learning benefits from multiple views of a subject area.
- Learning is facilitated by authentic activity relevant to the situation in which it is used.
- Learning is affected as much by motivational issues as by cognitive issues.
- Learning is collaborative, with meaning negotiated from multiple perspectives.

Effective instruction needs to include a social component. Learners must have the opportunity to share their ideas and align themselves with the information presented (Brush & Uden, 2000:[Online]). Online learning communities can offer just such a social component and therefore enhance the learning of online learners (Chih-Hsiung & Corry, 2001:245).

Communities and online learning communities have been described as follows:

> [A community is the] realm of local social relations that mediates between the private sphere of family and household and the public sphere of impersonal formal organizations. If the community is viewed as mediator, then the definition of an online learning community might be paraphrased as an organization that uses technology to mediate between the individual and collective needs of its members to assure access to tools for learning (Cahoon, 1998:8).

> [Online learning communities are] groups of people engaged in collective inquiry and enhancing their personal knowledge and application of the knowledge to work situations. In these communities, co-learners share knowledge and inquiry and find ways of using knowledge to pursue their cognitive and practical interests. Learning occurs from interaction in the network and from learning materials and databases (Shrivastava, 1999:[Online]).

Learning communities are characterised by people who have identified common needs and interests and who, by interacting, have created an online learning community around such needs and interests. They constitute a community in which people learn from each another by using technology to provide efficient and affordable learning opportunities (Russell, 1999:28; Shrivastava, 1999:[Online]). Previously, such mutuality was possible only if constituent members were in close physical proximity. However, with the advent of the Internet, and, to a lesser extent, other forms of telecommunication, meaningful interactions over long distances have become possible. Thus are learning communities able to expand beyond the borders of a classroom or an organization (Shrivastava, 1999:[Online]).

Table 2.7 on the next page reflects the principal features of an online learning community. The features include the vision of adult learning and development, learning contexts, engaged learning indicators, instructional model, purpose/goals of learning.

Table 2.7: Principal features of an online learning community (Russell, 1999:28)

Feature	Description
Vision of adult learning and development	It accommodates the special social, psychological, and political characteristics of adult learning.
Learning contexts	It demonstrates certain elements of non-formal and information-based models of learning.
Indicators of engaged learning	It provides learning that is transformative, enhanced by the wisdom gained from life experience, rewarding, and accommodative of learning differences.
Instructional model	It is interactive and generative. It provides opportunities for customise adult learning, and it adapts to a number of different learning styles.
Purposes/goals of learning	It supports collective and participatory communication and meets a diversity of educational and informational needs.

Table 2.7 provided a description of the principle features of online learning communities. The features reflect on adult learners and their educational and informational needs. These include the provision of fransformtive learning while accommodating learning differences and customisation of adult learning. However, it must be cautioned that all the arguments for the connective powers of Internet technologies must be considered on condition, ***it is used meaningful***. The poor application of technology can readily complicate content, confuse context and taint communities (Milliron & Miles, 1999:[Online]).

❑   **When is the application of technology in education meaningful?**

According to McManus (1999:[Online]), any technology that is educationally meaningful has to answer positively to the following three questions:
- Does it make learning more accessible?
- Does it promote improved learning?
- Does it accomplish both of the above points while containing, if not reducing, the cost of training?

These three questions are discussed in more detail below.

▪ **Increasing the accessibility of learning**

The term *access to learning* can be interpreted in various ways. Generally, however, it means making education more accessible to more people by providing learning opportunities in the workplace, home, school or university (Farrington, 1999:73; Ginsburg, 1999:12; Shrivastava, 1999:[Online]; Steed, 1999:14). Distance education is one of the means to increase the

accessibility of learning. With the event of the Internet and e-learning and the incorporation thereof into distance education it became an even more viable option as means of accessing learning. Steed (1999:14) is of the view that the *accessibility* of the Internet is one of its main assets.

A classic example of a committed distance education institution that uses the Internet to support its mission of providing accessible education, is the Open University in Milton Keynes, England. Since its foundation in 1969, the Open University has been acknowledged as a leader in providing distance education. Approximately 200 000 students from around the world are studying over 300 different courses at this university (Steed, 1999:14).

The authors of a Canadian study on web-based nutrition courses reported that many workers from Canadian indigenous communities wish to upgrade their skills and knowledge in (among other things) nutrition. Since these workers were unable, for various reasons, to attend face-to-face courses, the Internet and e-learning created an opportunity for quality training through online courses. These courses had to be learner-centred and flexible, and had to accommodate the cultural, language and literacy levels of target learners. The authors are of the opinion these considerations are also relevant to the African context (Trifonopoulus et al., 2002:S26).

Research from the Canadian study indicated that despite various problems such as unreliable computer and Internet access, the learners perceived the course to be a very positive learning experience. The developers of the course gained more knowledge about what is involved in developing an effective course for a specific target population and in particular what is needed to create the incentives and support that motivate participants to complete the course (Trifonopoulus et al., 2002:S26).

Schulze (2000:248) reports that the development of web-based courses at South African distance education universities is only now beginning to emerge. Unisa and TSA have been the two major providers of distance education on tertiary level in South Africa. Unisa is in the process of integrating Computer Mediated Communication (CMC) and www technologies into their programmes, and this is expected to grow. The university provides electronic (Internet) facilities for applying to the university, registering for courses, and submitting assignments and questions. Students are also able to access their assignment and examination marks electronically. A small number of courses provide e-learning as support to the paper-based mode, others offer a mixed mode e-learning course (some e-learning activities are compulsory) and a very small number offer a fully integrated e-learning course (the complete course is offered through e-learning with no paper-based support). However, print-based tuition continues at present to be the primary mode of delivery at Unisa, with varying options for online engagement. Although access is a problem, Unisa is planning to increase learner access to computers. Unisa found that the numbers of students using their own computers and those accessing it from work are about

equal (Heydenrych, 2004). Unfortunately, none of the above facilities were available at Vista University. The only facility available for learners was access to their examination marks through the Vista University website.

There is a very gradually growing tendency for some of the more senior learners to submit their assignments via e-mail. When this happens, the assignment is accessed in electronic format and e-mailed back to the learner. After the incorporation of VUDEC into Unisa, the VUDEC learners also gained access to the Unisa facilities described above. VUDEC learners have not familiarised themselves fully with all the facilities available to them. Learners are encouraged to attend the information session on facilities available to learners, presented by the Unisa library.

Although the development of websites containing reliable information about nutrition is still in its infancy (Le Vallée, 2002:S9), a number of researchers are of the opinion that information and communication technologies can generate innovative ways of communicating information about nutrition and health (Venter et al., 2001:106; Attström & Larsson, 2002:S5; Elbon, 2002:S6). I could not find any local research on public nutrition and HIV and AIDS and distance education from the literature at my disposal. However, there was a report on a multimedia programme in anthropometry for dietetics learners. The authors did not comment on the value of this programme for training dietetic learners (Wenhold, Wolmarans & Nordhoff, 2002:S17).

Venter et al., (2001:106) reported on the application of computer-aided learning (CAL) in disadvantaged communities. After the intervention, the target population demonstrated a positive change in knowledge, attitude and behaviour. The target population also retained these positive changes. The authors concluded that it seemed as if the benefits of using this programme outweighed the drawbacks they experienced. Drawbacks listed were financial implications, the "non-human" nature of the computer (which may create a feeling that the health professional has abandoned the client), and the general aversion to new kinds of machines, technologies and modes of automation often experienced by older persons. The authors reported that the use of an interactive CAL nutrition programme is a viable method of delivering nutrition education to a low-income, adult population (Venter et al., 2001:111).

From the discussion above one can conclude that there is increasing evidence that distance education together with e-learning and the Internet are seen as a means to increase the accessibility of learning. The implementation of these technologies had proven to be effective and successful. The question concerning the nutrition and HIV and AIDS course and accessibility is then, how can the course be implemented so that learning is more accessible to the adult learners from previously disadvantaged communities? Information and communication technologies can generate innovative ways of communicating information about nutrition and health.

- **Promoting improved learning**

Although the Internet has proved to be a valuable means of increasing access to learning (Ginsburg, 1999:12; Steed, 1999:19), the ways in which it can function to promote learning are not agreed upon by experts (Steed, 1999:19). There is an ongoing debate in the instructional design literature on whether any of the media used display any distinctive or unique features that promote learning. The debate is kept alive by evidence that, with more than 50 years of research on instructional media behind us, no medium apparently consistently and significantly confers on learners an enhanced ability to learn more effectively (Owston, 1999:[Online]).

Not everyone agrees with this interpretation of what benefits *do* accrue to learners and how and why this happens. There are authors who argue that a primary factor in determining improvement in learning is matching the delivery mechanism to an individual's learning style (Kozma, 1987; Owston, 1999:[Online]). Orr (1999:[Online]) has published a list of studies that detail how and why online learning is superior to conventional learning. Table 2.8 below lists two examples where e-learners demonstrated a significant improvement on various scales that indicate improved learning skills (in contrast to control groups enrolled for conventional learning).

Table 2.8: Examples of research that indicated that e-learning was found to deliver significantly better results than conventional training

Example of research	Reference
A social statistics course was presented in the form of a virtual classroom. The learners scored 20 per cent higher on mid-term and final examinations than those following the same course in a traditional classroom. Learners attending the virtual class spent more time on class work and understood the material better. After completing the course, these learners were also found to possess a more positive attitude towards mathematics in general. The learners' perceptions were that the virtual class provided opportunity for more peer contact and appeared to be more flexible.	Schutte (1997:6)
A virtual classroom was used to train learners simultaneously in three states of America. This brought about an increased enrolment factor of three while the learner satisfaction was increased by 20 per cent. Retention increased by 25 per cent, student satisfaction rates by 30 per cent, and demand by 30 per cent. Cost of delivery decreased by 80 per cent.	Maher (1998:7)

Some researchers argue that apparent enhancements of learning abilities are the result of improved *instructional design* – rather than a consequence of the *medium* that delivers the

instruction (Clark, 1994; Owston, 1999:[Online]). Russell (1999:[Online]) published a bibliography of 355 research papers, reports, and summaries that have found no statistically significant differences in effectiveness when one compares learning in the classroom, through distance education, through videotapes, by interactive video, through CBT, or through e-learning. This finding is called the "no-significant-difference phenomenon". Table 2.9 below lists examples of research showing that e-learners do not show any significant improvement in learning abilities or examination results when compared to conventional learners. The results also reported that learners found online learning just as effective as traditional classroom learning.

Table 2.9: Examples of research that found no significant difference between e-learning and conventional training

Example of research	Reference
Western Michigan University learners, enrolled for a new geography course conducted on the Internet, achieved the same results as those in traditional classroom courses. Ninety per cent expressed satisfaction with the course.	Microsoft Corporation (1999:[Online])
Western Michigan University initially offered six e-learning business courses and found them to be just as (but not more) effective than their traditional classroom counterparts.	Gibson & Herrera (1999:5)
Online and traditional classroom learning was equally effective.	McAlpin (1998:6)
Community college students experienced the online course design just as effective as a traditional classroom. Their learning experiences were exceptionally satisfying.	Ward (1998:6)
The performance level of learners on a web-based course was equal to those attending a lecture-format course. (However, those learners with access to *both* formats, showed improved performance.)	Goldberg (1997:2); Horton (2000:24)

Moore and Kearsly (1995:18) drew the following conclusions about the studies that seemed to prove that no significant difference between the performance of e-learning and classroom could be detected:

> Evidence does not exist in sufficient *quantity* to support the opinion that classroom training is the ideal delivery method. Instruction at a distance can be as effective as classroom instruction to induce learning. The lack or absence of face-to-face contact is not in itself damaging to the learning process. The result of how well a

course is designed, delivered and conducted makes it a good or poor course, not whether the learners have face-to-face contact or are at a distance.

Notwithstanding the *no-significance learning difference* school of thought, e-learning can offer learners some benefits. The discussion below highlights some of these benefits.

❑ **What benefits does e-learning offer distance education?**

While acknowledging the *no-significance learning difference* school of thought, I am of the opinion that e-learning does confer benefits on learning and learners alike, especially in the context of distance education, and in South Africa in particular. Horton (2000:22) is of the view that wherever *instructional design* is optimal, e-learning may indeed provide a more effective learning experience.

▪ **E-learning provides structure for accessible, flexible, and lifelong learning**

The accessibility of the Internet is a feature of this medium that provides an effective means of education to learners without the necessity of physical attending lectures. Accessibility – even in remote places – is an important feature of the Internet as a medium. Because of its accessibility, it can provide education for learners who are unable to be physically present at lectures (as they would have to be in traditional education situations). Increasingly, more and more institutions are also granting their full-time learners greater flexibility in accessing their courses through the Internet (Steed, 1999:20).

Web-based study projects, online activities and reading matter are published on the web. This enables learners to access it at their own convenience and proceed at their own pace (Duderstadt, 1999:10; Kurup, 1999:[Online]; Steed, 1999:20). They can move as fast or as slow – within reason – as they choose, and match their progress to their ability (Maeroff, 2002: Online). E-learning allows learners to repeat lessons they find especially difficult or interesting while skipping others they have already mastered or they feel are not relevant to them (Farrington, 1999:88; Robinson, 1999:[Online]; Steed, 1999:31). Often, self-paced programmes are completed more quickly than single-paced classroom courses.

Learners have the flexibility to take e-learning into their own home and "wrap" the work and content they do in the course around their personal schedules so that efficiency is maximised. They can even complete different parts of a course at different times. In this way, students can really take control over their own learning environment (Steed, 1999:31).

In daily life, adults do not have a "teacher" at their side to guide them in their learning and decision making processes. Learners need to be taught how to find information on their own or in partnership with others. Learners are in personal control of the use of their Internet links and

other media. Although these resources are no guarantee of learner initiative, they do create a situation in which the learner must function autonomously in a world where autonomy is associated with maturity, adulthood and self-actualisation (Kassop, 2003: Online). Because life-long learning is now an accepted reality in most cultures, it is available to anyone who wants to learn or to take a course whenever and wherever it suits them (Duderstadt,1999:24; Steed, 1999:31; Boisvert, 2000:[Online]; Stokes, 2000:[Online]). Although face-to-face contact between lecturer and learner is lost, and some may disapprove of this, there are some teaching staff who believe the quality of online interaction and learning is actually superior than its face-to-face equivalent (Steed, 1999:20).

The question concerning the nutrition and HIV and AIDS course is: How can e-learning be implemented into this distance education course so that it provides access, flexibility and lifelong learning to adult learners from previously disadvantaged communities?

- **E-learners are interactively involved in the learning event**

Interactive e-learning events do not allow learners just to sit passively and listen to a lecture or watch a video. E-learners need actively to navigate a course in order to progress. They must think, respond and be actively involved and learn. They may be required to select which lessons they want to take and the sequence in which they want to do them. Activities are planned in such a way that practice sessions alternate with presentations (Horton, 2000:22; Mulligan & Geary, 1999:[Online]).

When used appropriately, the interactive nature of e-learning can enhance learning (Kilby, 1999:[Online]), and increase learners understanding of the course material by as much as 56 per cent over classroom versions (Steed, 1999:31). When information is broken into short sections ("chunked") and it is offered in an interactive format, learners also *retain* 25 to 50 per cent more of the course material than do learners engaging in face-to-face versions of courses (Allen, 1997:34; Kroll, 1999:[Online]; Steed, 1999:31; Velleman, in Rickard, 1999:[Online]). Learners also show an improved ability to *use* what they have learned to enhance their performance ("transfer") (Anon, 1998:[Online]; Kilby, 1999:[Online]).

E-learning combines the best of self-paced, self-study training with the best of classroom training in that a course tutor is available and interaction with other course participants is encouraged (Steed, 1999:31). It needs to be taken into account that learners who have not been exposed to face-to-face contact often require more attention and feedback from instructors than would otherwise be the case (Farrington, 1999: 88; Iadevaia, 1999:13). Several instructors were of the opinion they had to take on the role of private tutors (Iadevaia, 1999:13). Distance education learners are often also more demanding when they study by means of e-learning. Because of staff constraints (there is only one facilitator per course and no tutor support), and because

distance learners study at different times of the day, the facilitator cannot always be available. In spite of these difficulties, learners' have to be accommodated in one way or another so that they do not feel abandoned or become discouraged.

Further questions about the nutrition and HIV and AIDS course would thus be: (1) How can e-learning be implemented into the distance education course so that learners become actively involved in learning events and construct their own knowledge with limited facilitator participation? (2) How can e-learning be implemented so that it relieves the facilitator from some of the usual assessment duties?

- **Distance education e-learners are exposed to real-world data and in-depth learning experiences**

The Internet exposes learners to a large variety of real-world data and experiences (Duderstadt, 1999:8; McGrath, 1998:[Online]). This is an important factor in the case of distance education learners from previously disadvantaged rural communities. These learners do not have access to a library, or only have access to a small town or mobile library. These libraries usually do not have academic related information nor do they provide the latest information or the variety or experiences that learners need. The Internet can provide this kind of information. Just think how many reliable websites are available on HIV and AIDS, for instance.

The Internet gives learners access to authentic data for study, comparison and analysis. Learners can collect data from online-journals and number of websites and enter it into for example, spreadsheets (such as Microsoft Excell). They can then analyse these collections of data and note all irregularities, exceptions and significant correlations (Bartolic-Zlomislic & Bates, 1999:375; Horton, 2000:23). (The intelligent handling and processing of such quantities of data is itself a challenging educational experience.) A study indicated that 85,7 per cent of a group of learners found access to large quantities of online data useful (Lesser, 1998:[Online]).

However, not all the information available on the Internet is either reliable and authentic. This is even more evident in a potentially controversial field such as HIV and AIDS and the nutritional aspects of the disease. When one designs a distance education e-learning course in nutrition and HIV and AIDS, how then should one ensure that learners will receive only the kind of reliable information that will provide them with correct basic facts about nutrition and nutrition and HIV and AIDS?

Learning becomes actual and applicable and learners are able to test their ideas against those of others. For example, an eight-grade science class in the USA were asked to investigate micro-organisms found in pond water. The US learners were of the view that the organisms found in different countries would be different from those they found in their local ponds. They contacted

similar classes in the United Kingdom, South Africa and Japan. On examining photographs posted by the Japanese class, they found the same organisms that they had found in their own country. They therefore had to revise their theories. E-learning exposes them to more facets of the subject that made them think more deeply about the issues they were studying, and thus enriched their learning experience and made it more self-reflective and comprehensive (Anon: 1998:[Online]; McGrath, 1998:[Online]).

Exercises similar to those described above can be given to learners studying nutrition and HIV and AIDS. One could design a group activity that requires learners to carry out research into how other African countries apply nutrition therapies to support and maintain the health of PLWHA. Learners might also be asked to investigate the nature of the indigenous and traditional foods and herbs that are used to treat HIV and AIDS in the various regions of South Africa, and what evidence-based research exists to support or refute the efficacy of these treatments.

It is undeniable that assignment activities that require extensive Internet involvement *can* sometimes become costly, time-consuming and thus frustrating and prohibitive. The limited bandwidth that only permits a slow downloading of information, and the high cost of telephone calls in South Africa, are both factors that curtail the current full potential of e-learning in South Africa. How can a distance education course be designed that makes creative use of the benefits of e-learning but that limits the cost and time spent on the Internet?

- **E-learning facilitates collaborative learning and a sense of belonging**

Although some studies have reported that many learners prefer the traditional face-to-face format (Microsoft Corporation, 1999: [Online]; Lesser, 1998:5), not all learners have the choice of attending traditional lectures (because of personal and other factors) and have no option but to study by means of distance education.

One of the major problems for distance education learners are feelings of isolation and loneliness. Distance education learners do not know who their co-learners are and usually have no opportunities of talking to other learners. Although an e-learning course does not give a learner access to other learners and the facilitator in the flesh (although" webcam" technology can provide visuals), an interactive and well-planned e-learning course can to a large extent ease problems of isolation and loneliness. However, if the Internet functions as a mere tool to broadcast leaning materials "...human contact is lost, students are isolated, and the educational experience is passive, limited, and alienating." (Bostock, 1997:226).

Online instructors have observed that learners develop a strong sense of community that enhances the learning process (Kassop, 2003). The Internet promotes collaborative learning because it offers features such as synchronous and asynchronous communication, shared work

space (such as whiteboards or video conferencing). The Internet can also be used for other class activities such as "virtual conversations", class discussion forums via the Internet "chat" facility and informing learners about the latest news and events via e-mail (Steed, 1999:20). Learners can work together on projects, research questions, solve problems, have discussions, debate or brainstorm sessions (Ginsburg, 1999:13; Horton, 2000:37; Larson, in Rickard, 1999:[Online]; McGrath, 1998:[Online]). Many learners feel they learn more from conversations with fellow learners than from the instructor or textbook (Horton, 2000:37). In the process, they do not only learn from each other, they also feel less lonely and have a sense of belonging. Working together also improves their problem solving skills, creativity and critical reasoning (Hopey, 1999:27; Mulligan & Geary, 1999:[Online]; Baron & Goldman, 1994:101) Skills that learners need if they want to success in the course on nutrition and HIV and AIDS.

Kassop (2003) disagrees with the notion that e-learning is lonely and impersonal. His experience revealed that there is often e-mail contact between learners and facilitator during and long after completion of the online course.

Questions that need to be answered about the nutrition and HIV and AIDS course are: (1) How can e-learning be presented in a distance education course so that it brings learners (who often live in remote rural areas) into contact with one another? (2) How can e-learning be presented so that it enables and empowers collaboration between learners and helps them to explore and debate the new knowledge and insights that they have gained? (3) How can e-learning be presented so that it stimulates learners to construct their own knowledge and conclusions about nutrition and HIV and AIDS?

- **E-learning provides immediate feedback**

E-learners have evaluated online learning positively, citing flexibility and individualised feedback as helpful features (Dauscher, in Morris, 1999:[Online]). Learners typically receive their results from a test taken in the classroom only days later. With e-learning, test results can be delivered to learners within seconds after they have completed an automatically scored – test thus providing then with immediate feedback (Hills, 2000:33; Steed, 1999:31).

The availability of the Internet, spreadsheet, database, modelling, simulation software and other technologies have provided instructors with new and innovative means to create original and imaginative methods of teaching "traditional" subjects. Activities where learners collect and/or analyse real-world data, make observations, investigate relationships and ask *what if* questions, are supported by these tools. These kind of investigations are usually entertaining and absorbing (Ginsburg, 1999:14). Schank (1999:55) is of the opinion that web-base courses do not need lectures – they need one-to-one instruction. Instructors are required to surrender some *control* as

well as their position as the *fount of all knowledge.* Instead they should function as a resource, instigator, and challenger (Ginsburg, 1999:14).

The time it takes for learners to receive feedback on their assignments at South African distance education universities is a major problem. The issues related to this problem will be discussed in more detail under research question 3.

- **E-learning improves learner-instructor communication**

It has also been observed that communication with instructors is far more frequent and effective than it in a classroom situation. After completing an online course at the University of Dallas, a student commented: "I actually felt that my asynchronous instructor was easier to approach with questions than my classroom teachers" (Kroder et al., 1998:[Online]). A learner at the Christopher Newport University wrote the following when evaluating an e-learning course: "Through their [the students] discussions I learned a great deal about them because they spoke up more than if they were in class" (Mulligan & Geary, 1999:[Online]).

At the University of Pennsylvania, the Internet is increasingly used as a medium for class discussions. A professor at the English Department whom runs a listserv, found that learners are more frank when conversing on a screen than in a class situation, in particular when they have missed a class. Typing on a keyboard gives learners time to think and reflect. It also gives the shy courage to speak out (Farrington, 1999:85).

When instructors were asked their opinion about the consequences of the lack of teacher-learner contact often associated with distance-learning, all instructors claimed they came to know their online learners, through their writing, as well or better than their campus learners (Mulligan & Geary, 1999:[Online]).

My own experience of learners at VUDEC has taught me that many learners (including of course learners enrolled for the HIV and AIDS course) are reluctant to speak out. Learners will speak personally to, or telephone, the facilitator/lecturer and enquire about administrative issues or ask you to explain some point of subject content, but very few learners will speak out on subject-related *issues*. This may attributable to cultural differences. Differences among cultures in their approach to teaching and learning been reported (Bates, 1999:8). Bates (1999:8) reports that the "Western" (e.g. American, British and Australian) approach to learning is to "encourage critical thinking skills, debate and discussion, where students' views are considered important, and where the views of teachers can be legitimately challenged and where student dissent is even encouraged." (These activities are also encouraged in the nutrition and HIV and AIDS course.) In other cultures, it is appropriate to "show respect" towards the lecturer by not challenging him or her or even by expressing an opinion on a topic. Bates (1999:8) states that in many cultures it

would be regarded as "culturally alien" to do these things. Bates (1999:8) also states that although more research is needed, it appears as a learner's willingness to participate in online forums is related to his or her cultural background. This "respect towards the lecturer" could be a reason for what I experience. It is, however, beyond to scope of this study to examine this phenomenon in any depth.

> "We reward through grades students who participate actively and work collaboratively through discussion forums, and this will seriously disadvantage students for whom this is an alien or difficult approach to take, even for those willing to work in this way. I therefore find myself wondering to what extent I should impose 'Western' approaches to learning on students coming from other cultures, while acknowledging on the other hand that this 'new' or different approach may have attracted them to the courses in the first place." (Bates, 1999:8.)

If one takes Bates's statements into account, the question becomes more difficult. How does one improve *learner-instructor communication*? The nutrition and HIV and AIDS course demands that they speak out and challenge other people's opinions. How does one then go about getting learners to participate in discussions and voice their views without disadvantaging the learner?

- **E-learning reduces travel and travel expenses**

Travel expenses (which include the costs of fuel, parking, transport fares, distances travelled, accommodation, meals and telephone calls) are reduced substantially by e-learning (Stokes, 2000:[Online]; Driscoll, 1999:21; Anon, 1998:[Online]; Ives & Jarvenpaa, 1996:[Online]). One company estimated that travel expenses for face-to-face training of 1200 employees amounted to US$5 million (Kroll, 1999:[Online]). Travel expenses contribute up to 40 per cent of corporate training costs (Becker, 1999:4).

Learners who are required to attend contact or practical sessions at VUDEC have to pay the travel expenses mentioned above. This is an expensive exercise that one does not always take into account when one budgets for one's studies. How can travelling and travelling costs be reduced for learners from previously disadvantaged communities and rural areas as one implements e-learning in a distance education course?

❑   **Reported positive and negative aspects of e-learning modules**

Although the researcher could not find any reported literature on the implementation of e-learning as part of a postgraduate distance education course in public nutrition, a study reporting on the exploratory evaluation of four newly developed online modules for post-registration nurses (Wilkinson et al., 2004:421). Learners participating in the study were asked to identify one positive

and one negative aspect about the e-learning course. Table 2.10 below lists the positive and negative aspects that learners identified (Wilkinson et al., 2004:421).

Table 2.10: Positive and negative aspects of e-learning courses (Wilkinson et al., 2004:421)

Positive aspects	Negative aspects
• Linked theory to practice	• Induction day too overwhelming
• Increased clinical confidence and skills	• Time management needs to be more disciplined
• Relevance to practice	• Problems accessing the web
• Improved IT skills	• Problems with passwords
• Highlighted accountability	• Shortage of IT skills
• Enjoyed time out to learn	• Need for clarification of outcomes
• Enjoyed networking	• Practice supervision difficult to find
• Enjoyed web materials	• Lacked human interaction (isolating)
• Flexibility	• Prefer more group interaction (seminars)
• Improved theoretical knowledge	• Needed more study leave
• Emphasized patient perspective	• WebBoard was confusing
• Lots of information	• Overwhelmed by the information
• Enjoyed links to other resources	

Table 2.10 listed the positive and negative aspects that learners had identified about distance education.

The study reported that the learners in general experienced the e-learning distance education courses in a positive way, especially the flexibility that they provided, the control that they gave to learners over where and when they could study, and the quality of the study material they received. Some learners experienced the new means of access to information as something most desirable, and something that they would be able to use repeatedly in the future for their professional development. On the negative side, learners felt that there was a lack of human contact, that there were too many computer problems, that printed material was insufficient, and that the materials were too prescriptive (Wilkinson et al., 2004:423).

The question that needs to be answered in the nutrition and HIV and AIDS course is: What do these adult learners from previously disadvantaged communities experience as the positive and negative aspects of distance education in an e-learning course?

❑   **Conclusion**

It is evident from the literature that there is a great deal of support for the implementation of e-learning in education and training because of its success in practice. In distance education specifically, the thoughtful application of e-learning can make a decisive contribution to the effectiveness of the teaching and training of learners. It has become apparent to me that most of the literature argues for or against e-learning in the context of face-to-face teaching and learning. Very little however has been published about the role of e-learning in *distance education* institutions. The vital question for distance education institutions is what can be done to add value to distance education by making it more interesting, interactive and challenging while providing the relevant information that learners need. Clearly, it is of little value to duplicate the printed page of paper-based tutorial materials without talking advantage of the unique possibilities inherent in electronic media such as personal computers and the Internet. Since all of the study material at Vista University is in a black-and-white printed format (management's view is that colour printing is too expensive), difficulties experienced with this format can be demonstrated in the following examples.

How does one reinforce in black and white the understanding that it is the *colour* of fruit and vegetables gives a good indication of the nutrient content of the food? The Internet, e-learning and their accompanying features have ready-made solutions to this problem and their presentation rises above the limitations of printed black-and-white study material. E-learning provides us with the means to make subject content more interesting, vivid, compelling and interactive. It also gives us access to numerous up-to-date resources at a fraction the cost that would have to be expended to reproduce similar features in print. To a large extent, features specific to e-learning, such as synchronous discussions, e-mail, listservs and discussion forums, can ease the feelings of isolation and solitariness that many distance education learners experience.

Learners also need to learn new skills and to develop their own methods of acquiring relevant information and presenting it to others in a structured, well-organised, coherent way as they acquire new knowledge in their field of study. In my experience, most of the learners who enrolled for the nutrition and HIV and AIDS course and who had previously attended residential institutions, lacked such skills. I found that learners can be given the means to acquire the skills that they lack by means of good planning and presentation of content, by the provision of imaginative activities that are made immediately relevant to the situation in which content is used, by exposing learners to multiple views in a subject area, by challenging learners to reflect and build on their existing knowledge, and, lastly, by structuring individual and group activities around the content. If learners are to be empowered and skilled so that they are in a position to engage in independent, life-long learning, they need skills such as synthesis, critical thinking, the critical evaluation of information, and the ability to communicate and explain themselves clearly. When study material is presented by means of e-learning, learners are provided with opportunities to acquire knowledge in ways that are not possible to experience in the printed modes (however elaborate) of distance education learning.

The next section will discuss the constraints associated with Internet and e-learning and their role on distance education.

2.2.3   Internet and e-learning constraints

Research Question 3
What constraints hinder the utilization of e-learning and the Internet in the distance education nutrition and HIV and AIDS course?

Constraints are of the challenges that need to be considered before developing an e-learning course in nutrition and HIV and AIDS. If constraints, problems and disadvantages are identified beforehand, they can be anticipated and compensated for in the implementation phase, thereby reducing the possibility that problems will emerge later (Carliner, 2002:Online).

McMullen (1998:32) is of the view that regardless of the goal, a *constraint* may be defined as anything that prevents a system from accomplishing its goals. Goldratt (1992:297) describes a constraint in a system as anything that limits the achievement of the system's objectives. Austin (No date:[Online]) is of the view that, in distance education, there can sometimes be "an imbalance between the output capacity of the infrastructure and the actual student demand and [that] this leads to either a surplus or a shortage of capacity. If there is a shortage, there must be a constraining resource in the system."

There are numerous constraints that limit the implementation of e-learning in the nutrition and HIV and AIDS course and these constraints vary according to specific situations. The two tables below deal with (1) constraints that affect adult learners and their learning situations and (2) technology constraints that will affect learners in an e-learning situation. However, the lists below are by no means complete and as situations change, so will new and different constraints emerge.

Table 2:11 on the next page lists questions that can help one to identify and provide remedies for constraints associated with distance education that will affect learners in the learning situation, subject matter and study material. The constraints that are listed in Table 2.11 are access to computers, previous computer experience, online learning experience, learning environment, subject matter, study material pedagogy and pedagogy and the www.

Table 2.11: Questions that can help one to identify and provide solutions to constraints that can affect learners in an e-learning situation (Adapted from Hill, 1997:76-78; Carliner, 2002:[Online])

Constraint	Questions
Access to computers	• Do all the learners have personal computers (PCs)? • If not, how many learners do have their own PCs? • If a learner does not have a PC, does he or she have access to a PC? • How many learners do not have access to PCs? • Does the organization have *Learning Centres* or similar facilities where learners can have access to computers and online courses?

Previous computer experience	• Can learners perform the following tasks?
	  - Turn on (boot) the PC
	  - Start programs using Windows
	  - Type input using a keyboard
	  - Use a mouse
	  - Use general applications such as word processor and spreadsheet software, browsers, e-mail and surf the Internet

Online learning experience	• Do learners have online learning experience? • How do learners feel about online learning? • How many feel positive and keen about online learning? • How many learners feel intimidated by technology?
Learning environment	• Does the learning environment enhance or obstruct learning? • How much interruption (cellular phones, the Internet, and other sources) are learners going to be exposed to? • How likely will learners be to respond to interruptions? • How much privacy will the location allow the learners to have? • Is the available physical space adequate for using other materials?
Subject matter	• Can the subject matter accommodate e-learning? • Is the design team involved in the development of subject matter features that are executed with the computer? • Are there options for integrated learning resources and the computer?
Study material	• Do learners have the means and facilities to access the study material? • How long is the turn-around time of assignments and feedback?
Pedagogy	• What media are used to deliver instruction? The more reliance is placed on technology for instruction delivery, the more constraints can develop. • What is the impact of distance learning on learners? Do learners feel lonely and unconnected?
Pedagogy and the www	• How much information is given? • How is information overload limited?

From Table 2.11 one can see there are various questions that can be asked concerning each of the constraints listed. The questions are concerned with what computer access options are available to learners, are learners able to perform basic computer operation tasks, what are their experience and feelings concerning online learning and how conducive is the learning environment to learning. Questions are also raised concerning the compatibly of the subject matter with e-learning, logistics involved with providing learners with printed material and the pedagogy associated with the offering of distance education courses.

Table 2:12 below lists questions that identify technology constraints that will affect learners in an e-learning situation. The constraints include technology infrastructure, the organisation and additional questions about technology infrastructure.

Table 2.12: Questions that can help one to identify and provide solutions to technology constraints that will affect learners in an e-learning situation (Adapted from Carliner, 2002:[Online])

Possible constraint	Questions

Technology infrastructure	Does the workstation (whether in a typical office setting, a manufacturing area, or a technical group) contain all of the following facilities or capabilities?
	  - a minimum operating system (Windows 98)
	  - minimum disk storage (18.6 Giga byte)
	  - a minimum main memory (256 kB)
	  - installed office applications (such as MS Office)
	  - other standard applications
	  - a web browser (type, level, supported or not)
	  - a sound card
	  - a CD Rom drive
	Printer access which is:
	  - attached to the PC
	  - on a LAN within the facility
	  - within the building

Organisation	Has the organisation chosen a Learning Management System (LMS) or Learning Content Management System (LCMS)? If so, what have they chosen?
	Has the organisation chosen software for:
	  - authoring content? (If *yes*, which software?)
	  - synchronous communications? (If *yes*, which software?)
	  - asynchronous communications? (If *yes*, which software?)
	  - preparing graphics? (If *yes*, which software?)
	  - preparing animations? (If *yes*, which software?)

Additional questions about technology infrastructure	How frequently are PCs replaced? Does bandwidth accommodate demand? How reliable is server availability (i.e. how often are servers down)?

As indicated in Table 2.12 the questions concerning technology constraints include the capabilities of the workstations, the organisation and their choices related to management systems and software, and the availability and reliability of the technology infrastructure. There are also other constraint issues such as whether or not existing staff are capable of producing and managing online learning, financial constraints, and constraints that arise out of the standardisations of development tools, which are beyond the scope of this study.

The literature indicates that lecturers/facilitators at sub-Saharan Africa higher education institutions experienced similar constraints as discussed above with the implementation of e-learning (Axmann et al., 2002:272; van Brakel & Chisenga, 2003:479; Dutton, 2004:77; Mutula, 2002:100). Some of these most pressing constraints are listed below:

- Learners' limited computer skills
- Access to personal computers and the Internet
- Dial-up connections from home
- Limited bandwidth
- Cost of Internet access and telephone lines
- Limited resources and infrastructure
- Technical and telecommunication problems
- Maintenance and technical support
- Learner and staff development and training
- Funding

The rationale behind identifying constraints is based on the philosophy of the theory of constrains (TOC) which states that any system (or organisation) has a constraint, or a small number of constraints, which affect the whole system. If one's aim is to achieve success and obtain the best from an entire system, the constraints and the system (as it interacts with the constraints) must be effectively managed (Balderstone & Mabin, No date:[Online]).

Although the TOC has its roots in the manufacturing management philosophy, it has developed into a theory about management (Balderstone & Mabin, No date:[Online]; Fox, No date:3). The TOC has two major components, namely a philosophy that underpins the working principles of the TOC, and a series of thinking tools (Fox, No date:3). The working principles that focus on physical constraints consist of five steps that one may use to effect increasing improvements, while the thinking process addresses managerial-policy constraints and the effective implementation of on-going improvement (Rahman, 1998:337). "TOC is increasingly being applied to situations outside the manufacturing context, including distribution, marketing, project management, accounting – in fact, any situation involving change to a system" (Balderstone & Mabin, No date:[Online]).

Table 2.13 on the next page gives the concepts that apply to the TOC, namely *every system must have at least one constraint* and *the existence of constraints represents opportunities for improvement* is described.

Table 2.13: A summary of the TOC concepts (Goldratt, 1992:297; Rahman, 1998:337)

Concept	Description
Every system must have at least one constraint.	If this statement is false, an organisation (the system) will have a capacity for unlimited profitability. A constraint therefore "is anything that limits a system from achieving higher performance versus its goal" (Goldratt, 1992:297).
The existence of constraints represents opportunities for improvement.	From a TOC perspective, constraints are regarded as positive, in contrast to the conventionally negative view of constraints. "Because constraints determine the performance of a system, a gradual elevation of the system's constraints will improve its performance" (Rahman, 1998:337).

Table 2.13 describes what a *constraint* is and what the philosophy behind the TOC is. A constraint therefore "is anything that limits a system from achieving higher performance versus its goal" (Goldratt, 1992:297). Constraints are viewed from a TOC perspective as being positive because constraints represent opportunities for improvement.

The working principle of the TOC provides a focus for a continuous improvement process. This principle consists of five focussing steps. Table 2.14 on the next page lists these steps in the order of execution namely identify the system's constraint(s), decide how to exploit the system's constraint(s), synchronise everything else to the decision mentioned in the previous step, elevate the system's constraint(s), and if in any of the previous steps a constraint is broken, go back to the fist step.

Table 2.14: The five focussing steps of the TOC (Adapted from Goldratt, 1992:297; Rahman, 1998:337 and from Breen et al, 2002:44-45)

Focussing steps	Description
Step 1: Identify the system's constraint(s).	Constraints may be physical (e.g. study material, number of available computers, facilitators) or managerial. (For the purpose of this study, only the *physical constraints* apply.)
Step 2: Decide how to exploit the system's constraint(s).	In the case of a physical constraint, (deliver nutrition information to learners) the objective is to make the constraint contribute as much as possible to success.
Step 3: Subordinate/ synchronise everything else to the decision mentioned in step 2 above.	This is the most difficult but most important step. After the course developers have decided how to exploit the constraints to advantage (use the Internet and CD-Rom to deliver nutrition information), strategies must be developed to adjust all the other non-constraining system elements so that they support an optimal neutralisation of the constraint. Since constraints dictate a system's throughput, resource synchronisation with the constraint provides the most effective manner of resource utilisation. Non-constraint resources contain productive capacity (capacity to support constraint throughput) and idle capacity (capacity to protect against system disruptions and capacity not currently needed)). If non-constraint resources are used beyond their productive capacity to support the constraint, they do not improve throughput but increase the level of unnecessary inventory.
Step 4: Elevate the system's constraint(s).	If identified constraints are still the most important, invest in the constraints (e.g. make more computers available so that learners can access their study material) and turn them around so that they contribute to improved performance. When this has been achieved, the non-constraints can reach their potential, and the system's performance will improves overall. Eventually new constraints will develop.
Step 5: If in any of the previous steps of a constraint is broken (meaning eliminated, corrected or reduced), go back to step 1.	Do not let inertia become the next constraint. Over a period of time, and as the environment changes, an optimal solution will depreciate (more learners have their own computers). Therefore, the TOC process presupposes a process of continuous improvement.

Table 2.14 gave a description of each of the five focussing steps of the TOC for a continuous improvement process. The description identifies what type of constraint it is (e.g. physical or managerial), and then explains how to turn the constraint into an advantage that will improve performance. The TOC process is one of continuous improvement.

The capacities of distance education institutions are often limited by the constraints imposed learners by the structure of the system. However, capacity can be increased through the process of continuous improvement without any underlying increase in cost and without surrendering quality. By utilising the theory of constraint approach, one may find solutions to capacity management problems in distance education (Austin, No date:[Online]).

❑   **Conclusion**

As indicated in the discussion above, there are numerous constraints that limit the optimal implementation of e-learning in distance education. These constraints are applicable to the adult learners from previously disadvantaged communities enrolled for the nutrition and HIV and AIDS course. I limited the study to constraints that affect learners and their learning situations and to constraints that affect technology. As situations change, so new and different constraints will emerge. In my opinion, those constraints that are listed are the most common ones that e-learning practitioners will encounter. These were the same constraints that I identified during the course of this study.

The inevitable existence of constraints should not deter one from initiating processes that will benefit learners, give them advantages, and improve their situation. The difficulties encountered by a small group of learners who used e-learning to facilitate their studies can provide indicators and guidelines that will enable later designers and course managers to create well-managed and effective e-learning courses. In the process, many of the initial constraints will be eliminated or resolved, while those that remain will be able to be managed in such a manner that their effect on the course will be negligible. If success is to be achieved and the best is to be obtained from the system, it will be necessary to apply the theory of constraints to the process by identifying whatever constraints there are and by managing such constraints effectively. As Chambers (2004:149) states: "While daunting logistical challenges still remain … making life saving information available in real time, to anyone worldwide, is within our reach."

The next section will discuss the application of interface design principles in the design of an educational website.

2.2.4 Interface design principles

Research Question 4
What interface design principles would best facilitate the communication of nutrition and HIV and AIDS knowledge to adult learners from previously disadvantaged communities?

One of the neglected issues in e-learning concerns the interaction between learners and computers. A poorly designed e-learning interface makes learners feel lost, confused or frustrated. In addition, it will obstruct the retention of information and effective learning. In some instances, when learners do indicate that they prefer face-to-face instruction to e-learning, it is often not because of the e-learning, but because the confusing or ambiguous labelling of buttons, complicated menus and inconsistent links scare them off (Kruse, 2000a:[Online]).

How learners view and learn content presented in the format of an e-learning website is largely influenced by the interface of the courseware. The success of any learning programme is dependent on the attitudes of learners and how motivated they are. If one is going to design an effective e-learning website, one needs to know what one wants learners to experience when they interact with the website (Kruse, 2000a:[Online]; Usability Evaluation 2002:[Online]). These principles also apply to the design of the nutrition and HIV and AIDS learning website. It was important to me when I designed the website to identify what I wanted the learners to experience, and to find out whether or not they had indeed undergone the experiences I had intended them to have after I had tested the site experimentally.

Table 2.15 below lists three important interface design features namely navigation, orientation and overall design and then gives a description of each of these features.

Table 2.15: Interface features (E-learning development, 2003:[Online])

Feature	Description
Navigation features	Features such as buttons and links provide access to important and relevant information.
Orientation	Orientation means that clear signposts, markers or indicators tell learners exactly where they are within the course.
Overall design	The designer should choose a consistent design (i.e. a look, atmosphere or theme) that permeates the entire course. This will include colours, background graphics, fonts, visual elements, page formatting, and the names of key elements.

Table 2.15 described what the interface features entail. Navigation features comprise features such as buttons and links to information, where orientation entails the clear and simple signposting of the web site while the design of the web site should be the consistent application of colour, graphics, visual elements and page formatting.

To create an effective and efficient website that satisfies the needs of its users requires a design process and philosophy that is user-centred (Bevan, 1999:1; Katz-Haas, 2001:[Online]). "It is a philosophy that places the person (as opposed to the 'thing') at the centre; it is a process that focuses on cognitive factors, such as perception, memory, learning and problem-solving, as they come into play during peoples' interactions with things" (Katz-Haas, 2001:[Online]). A learner-centred approach makes it possible for learners to "… to become involved and motivated by the materials and to take ownership of the skills and knowledge that they acquire." (Swales, 2000:1).

The learner-centred design (LCD) approach recognises that the learners' needs, preferences and constraints (Padilla, 2003:1) are inseparable from the success (or otherwise) of a website's application. During the design of the learning website for nutrition and HIV and AIDS I had to identify learners' needs and preferences with regard to navigation, orientation and the design of the learning website. I had to know what would suit adult learners from previously disadvantaged communities best with regard to: (1) features such as buttons and links to relevant information, (2) the features that signposted the website (I had to be sure that learners – many with a very limited computer knowledge and from different cultures – would understand such features so that they would always know where they were in the website), (3) what they preferred in terms of design features such as colour, page formatting and visual elements. The constraints that one needs to keep in mind with adult learners from previously disadvantaged communities are: (1) the degree of learners' computer literacy, (2) the learners' cultural background, and (3) their degree of proficiency in English. Thus the careful attention to user or learner needs from a very early stage of the website's development cycle will provide opportunities to design applications that will ultimately be rewarded with a high degree of usability (Benjamin, 2002:2).

Table 2.16 on the next page gives a list of factors that need to be considered when developing user-centred educational websites. The factors include the extent to which learners will be involved, the extent to which one really knows and understands one's learners, the analysis of one's tasks and goals, exploration and repeated testing of usability. A summary of the implications behind each of these factors is also given. All the factors listed in Table 2.16 are applicable to the development of the nutrition and HIV and AIDS learning website for adult learners from previously disadvantaged communities and will be included in the study.

Table 2.16: Factors that need to be considered when developing user-centred websites (Katz-Haas, 2001:[Online])

Factor	Implications
The extent to which learners will be involved	Involve users from the beginning by: • discovering their mental models and expectations. • including learners as part of the design/development process. Observing learners in their natural surroundings while analysing their tasks, workflow, and goals. • eliciting feedback via walk-throughs, card sorting, paper prototypes, think-aloud sessions, and other evaluation methods.
The extent to which one really knows and understands one's learners	Ask learners questions about themselves and use the answers to guide development and design decisions. Such questions would typically elucidate the learners' situation with regard to: • computer and Internet access and literacy. • how much computer training (if any) they have or will receive. • their working and web-surfing environments. • their hardware, software, and browsers. • what they need and expect from the education website. • background knowledge concerning the subject matter. • their preferred learning styles. • the language(s) that they understand and their level of fluency in these languages, with special reference to English because it is the language of instruction in this case. • their cultural issues. • how much relevant knowledge and skills they already possess.
The analysis of one's tasks and goals	Observe and interact with learners (preferably in their daily surroundings), and then attempt to answer the following questions: • What are the tasks that learners need to perform? • How do they currently perform these tasks? • What is the workflow when they perform these tasks? • Why do learners perform their tasks in the way that they do? • What are the learners' information needs? • How do learners discover and correct errors? • What are the learners' ultimate goals?
Exploration	• Explore different designs and approaches and get user feedback before making final direction, development, and design decisions.
The repeated testing of usability	• Usability testing is an iterative process. • Conduct usability testing throughout the development cycle. • Usability testing can be conducted in usability laboratories or in relatively simple and inexpensive surroundings such in an office or at a workstation. • Usability testing is the **only** way of knowing if a particular site meets users' needs.

Table 2.16 summarised the implications of each of the factors that needs to be considered when one is developing user-centred educational websites. These include involving learners in the design/development process, getting to know learners by asking them questions about themselves, and using the answers thus obtained to guide development and design decisions. Analyse tasks and goals by observing and interacting with learners and by asking them questions about their computer use and skills. Explore different designs and approaches while at the same time getting learner feedback and doing usability testing.

For an e-learning project to succeed, a balance should be established between the target group learner needs and expectations and the requirements, strategic objectives and values of the organisation and its brand. Website developers should also consider the constrains placed on a particular project which may include factors such as time, resources (including the available budget) and the technologies accessible to the target user base (Preston, (No date):[Online]. All these factors listed are also applicable to the success of the nutrition and HIV and AIDS e-learning course.

There are various aspects that need consideration when designing an educational website interface that is effective and accessible. The most important aspects are summarised in the following three tables. The interface aspects are loosely grouped into three categories namely page design and layout, visual design and presentation and information processing.

Table 2.17 on the next page lists the most important page design and layout aspects of interface design, which include consistency, simplicity, navigation and resolution independent design. The rationale behind each of these aspects is then summarized.

Table 2.17: Aspects of user interface design: page design and layout. (Lynch & Horton, 1999:11-25; Ambler, 2000:1-2; Katz-Haas, 2001:[Online]; Nielsen, 2000:180, 188-221; Switzer, 2002: [Online]; CUErgo, (No date);[Online])

Page design and layout	Rationale
Consistency Learners should not be burdened with unwarranted design complexities. The best information designs are those that users never even notice.	Apply a consistent look, feel or theme for the entire course. Present information such as headings, images and colour consistently, and use same sequence of actions across similar conditions throughout the site. Use standard naming conventions. Terminology should be consistent between screens. Metaphors create expectations based on learners' prior knowledge. However, they only work if learners are familiar with and understand the metaphor and if it is suited to the content.
Simplicity Do not compromise usability for function	Maintain a simple and straightforward interface. Make functions easily accessible and usable. Break complex tasks into simpler tasks. Keep tasks easy by using familiar icons/objects, words etc.
Navigation Arrange navigation options uniformly	Provide navigational aids at the top and/or bottom of each page. Web pages should provide clear cues to the context and organization of the information. Make sure that recurring text or buttons appear in the same place on different pages. Limit scrolling; aim at keeping pages as short as possible. Design to a maximum of three navigational depths. Limit learner confusion and disorientation. Make sure learners can find what they are looking for by providing: • clear, consistent icons • graphic or text based overviews and summary screens • clear navigation between screens. • Learners should be able to return to the home page and other important navigation points easily. • Creating a graphic identity provide confirmation that learners are still in the site domain.
Resolution-independent design	Since learners use different screen sizes, design resolution-independent pages that will adapt to whatever size of screen is used to display them. The main principle for resolution-independent design is not to use a fixed pixel-width for any table, frames or other design elements. Always specify layouts as percentages of the available space.

Table 2.17 gave a summary of the underlying principles that govern the application of consistency, simplicity and navigation in the design of educational websites. Information should be presented in a consistent manner and the features should apply to all the web pages. The interface should be simple and easy to use. Navigation and the navigation elements should be clear, consistent and easy to use. Learners should know what to do and where to go to in the website. It is also advisable to design resolution-independent pages that will adapt to whatever screen size is use to display them.

Table 2.18 on the next page gives a summary of the next group of interface design aspects, namely visual design and legibility, and clarity of language.

Table 2.18 lists the most important visual design and presentation aspects of interface design, which include visual design, legibility and clarity of language. The rationale behind these aspects is then summarized.

Table 2.18: Aspects of user interface design: visual design and text presentation. (Lynch & Horton, 1999:11-25; Ambler, 2000:1-2; Katz-Haas, 2001:[Online]; Nielsen, 2000:180, 188-221; Switzer, 2002:[Online]; CUErgo, (No date);[Online])

Visual design and presentation	Rationale
Visual design	• Web pages should be interesting, simple and uncluttered. • Maintain display inertia. Make sure that the screen changes little from one screen to the next within a functional task situation. • Eliminate unnecessary information. • Keep important information at the top of the page. • Use "white space" to visually organize pages, to make important elements stand out. • Group information logically. Structure information rather than just present a narrative format. Comprehension is faster from a structured format. • Animated items can enhance visual satisfaction as long as they are functional and do not interfere with the learning process.
Legibility	**Font** • On text screens, don't use more than three to four fonts on a screen. • Experiment with font size and bolding to achieve desired legibility for Different content items or screens. • Sans serif fonts are usually easier to read online than serif fonts • Ornamental fonts and italics are difficult to read online. • It is difficult to read body text that is too large or too small. (9-11 pt sans serif and 11-12 pt serif seem to work well.) **Text** • It is difficult to read text that is all in uppercase letters. Use a mix of uppercase and lowercase letters. • Blocks of text longer than 50+ characters significantly slow reading. • Dark text against a light background is most legible.
Clarity of language	To foster clarity, use: • short, simple sentence structures. • everyday words (instead of jargon or technical terms). • the active voice rather than the passive voice for verbs. • concise, unambiguous wording for instructions and messages. • Developers should consider crossing cultural and national boundaries. Consider ambiguity in the form of: humour. (Humour does **not** translate well across cultures: at best, it is not understood, at worst, it can offend.) metaphors. (Different interpretation of metaphors across cultures can create problems.) jargon. (Limit the use of jargon, use it only if it is useful)

Table 2.18 gave a summary of the rationale related to visual design, legibility and clarity of language when designing educational websites. Aspects that need to be considered concerning visual design are the maintenance of display inertia, use of white space, positioning of information on web page, structuring and grouping of information and the use of graphics and animations. Legibility covers aspects such as font size, the legibility of various kinds of fonts, differentiation in text size and the colour contrast between font and background colour. Clarity of language entails the length of sentences, choice of words and expressions especially when using humour, metaphors and jargon. The following table gives a summary of the next group of interface design aspects namely information processing.

Table 2.19 on the next page lists the most important information processing aspects of interface design, which include cognitive directness, human memory limitations and attention. The rationale of these aspects is then summarized.

Table 2.19: Aspects of user interface design: information processing. (Lynch & Horton, 1999:11-25; Ambler, 2000:1-2; Katz-Haas, 2001:[Online]; Nielsen, 2000:180, 188-221; Switzer, 2002:[Online]; CUErgo, (No date);[Online])

Information processing	Rationale
Cognitive directness	• Minimise mental transformations of information (e.g. leaving a blank line between paragraphs). • Use meaningful icons and letters. • Use "real-world" metaphors whenever possible (e.g. desktop metaphor, folder metaphor, trash can metaphor, etc.)
Memory load	• Reduce learners memory load by: - organising information into a small number of "chunks". - limiting the length of sequences and quantity of information. - providing cues, signposts, indicators and navigation aids so that learners will know where they are in the website or at what stage they are in an operation. • Learners should recognise rather than recall information. • Screen elements should be meaningful and consistent across the site so that learners can recognise (rather than having to remember) what elements mean from one page to another.
Attention	• Use attention-getting techniques cautiously (e.g. avoid overusing "blinks" on pages, flashing messages, "submission dates", etc.). • Maximise attention. Maintain learner focus by introducing anticipation. • Focus attention by using captions in pictures, graphics and illustrations and teach learners to interpret certain cues such as specific colours, symbols, screen or display arrangement, etc. • Use colours appropriately and make use of cultural expectations and assumptions. Consider one colour for headings on home page and unit home pages. • Use only two levels of colour intensity on a single screen. • The use of a second colour could enhance usability when it is combined with bolding to emphasise key words, terms, etc. • If colour is used in the application, screens should still be readable. Use dark text on light backgrounds and light text on dark backgrounds. Don't use blue for text (it is difficult to read). Blue-coloured text usually indicates linked text. Blue is a also a good *background* colour.

Table 2.19 gave a summary of the rationale behind cognitive directness, human memory limitations and attention insofar as these considerations affect the design of educational websites. Aspects of

cognitive directness that need to be considered include the manner in which the content is organised on the web page and the use of meaningful icons, visual cues and metaphors. To accommodate human memory limitations, one should apply features such as the chunking of information, and the provision of cues, signposts, indicators, and navigation aids. Learners should able to recognise information rather than recall it. Attention is concerned with gaining and sustaining learner attention by applying colours in a variety of ways, and focussing attention is achieved by using captions in pictures, graphics and illustrations.

All the interface features listed in Table 2.17, Table 2.18 and Table 2.19 will be applied to the nutrition and HIV and AIDS learning website. This study will investigate whether all these features are relevant to the nutrition and HIV and AIDS website and how they should be applied to accommodate the needs of the adult learners from previously disadvantaged communities. Factors about the learners that need to be considered are (1) the learners' cultural backgrounds and the influence of these on interface design, (2) their level of computer skills, (3) their understanding of naming conventions and terminology, (4) the level of English used in the design of the website (i.e. whether the English will be comprehensible to second − and even third − language learners, and (5) the appropriateness of the use of various metaphors in the website.

❑ **Conclusion**

To communicate a knowledge of nutrition to learners in the field of HIV and AIDS by means of an online e-learning environment, learners should be offered a learner-centred website that is effective, accessible and easy to use. If this ideal is to be achieved, it is necessary to involve learners in the design and development process. What one will need from learners is information about their studies, their computer skills, their access to computers, and a description of their reactions when they interact with the website. The designer then uses this information to guide development and design decisions.

There are a large number of interface design principles that can be implemented in an educational website. These principles can be broadly grouped into three categories, namely, navigation features, orientation, and overall design − with simplicity and easy of use as the main point of departure. Information should be presented in a consistent manner and the features should apply to all the web pages. The interface navigation elements should be clear and consistent and they should promote intuitive navigation. Web pages should be clearly signposted so that learners exactly know where they are within the course. Learners should always be clear about what to do next and where to go to in the website.

The design of the website should be consistent and stable and should be applied to the entire course. Attention should be paid to the look, atmosphere or theme of the site, as well as to colours, background graphics, fonts, visual elements, page formatting, and the names of key elements. The

interface should be visually pleasing and should maintain display inertia. Web pages should be legible and should take into consideration the kind of font and font size used, and colour contrast between the font and the background colour. Content must be written in clear, simple language. Other points to be considered are the length of sentences, and the choice of words and expressions − especially when the designer uses humour, metaphors and jargon.

Design principles should also guide the designer to produce web pages that accommodate cognitive directness and human memory limitations. This necessitates the organisation of information into a small number of chunks, the use of meaningful icons, visual cue signposts, indicators and navigation aids, and metaphors. Learners should be able to recognise information rather than recall it.

The incorporation of all these factors will not necessarily guarantee a website that provides information easily and effectively. The usability of the site with real users should also be tested. Web usability principles will be discussed in the section that follows.

2.2.5   Web usability principles

Research Question 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?

Adults enrolling for distance education courses usually do so to gain or enhance their knowledge and skills. They are not there to play or idle the time away. They certainly do *not* want to have trouble accessing the study material or to have to struggle to manipulate the online e-learning environment. It is therefore important to provide learners with a website that permits them to accomplish the tasks they are set out to do in the most easy and effective way possible.

Participants finding themselves in this environment become both learners and users. *Learners* focus on gaining new knowledge and skills and meeting the course learning objectives. *Users* will access the course through the Internet, navigate through the various site screens while gaining information, engage in self-assessment and more formal assignment activities, access related websites, and interact with other learners through e-mail or discussion groups. It is clear from this that providing an effective and user-friendly e-learning environment requires addressing participants as both learners *and* users. If one wants to develop an e-learning course with good content and usability, one has to apply sound instructional design principles and usable technology courseware design (Switzer, 2002:[Online]).

❑ **What is web usability?**

Web usability is a method applied during the design process to improve the use of a website by addressing the relationship between tools and their users. A tool is effective when it permits users to accomplish tasks in the best way possible. The same principle applies to computers, websites, and other software (Usability first [TM], 2002:[Online]). It is the ***quality attribute*** that assesses how easy user interfaces are to use (Nielsen, 2003b:[Online]). "Usability relates to ease-of-use – a simple concept, but not always easy or intuitive to implement" (Katz-Haas, 2001:[Online]). Table 2.20 lists and describes the quality attributes of usability. The attributes include ease of learning, efficiency of use, memorability, error frequency and severity, subject satisfaction, control, skills and privacy.

Table 2.20: Quality attributes of usability (Cato, 2001:5; Usability basics, 2002:[Online]; Nielsen, 2003b:[Online])

Attribute	Description
Ease of learning	• With how much ease and speed can users who have never seen the user interface before, learn it sufficiently well to execute basic tasks and start with their work?
Efficiency of use	• After users have mastered the design and system, how readily and efficient can they perform tasks?
Memorability	• On returning to the site after a period of time, how easily can users master the site design again without relearning everything?
Error frequency and severity	• The system should have a low error rate. Users should feel they are making positive progress and that they are in control. If errors occur, they should not be serious ones, and users should recover from them easily. Catastrophic errors should not occur.
Subjective satisfaction	• Is using the system a pleasant experience for the user?
Control	• The system should allow users to feel that *they* are in control – rather than the system is controlling them.
Skills	• Users should experience the system supports, supplements and enhances their skills and expertise. When this happens, users feel respected.
Privacy	• The system should help users to protect personal and client information.

Table 2.20 gave a description of each of the quality components of usability. Questions concerning the ease and efficiency with which the attribute can be executed were asked. Errors should be limited and when they occur learners should recover from them easily. Learners should feel in

control of the system while it supports, supplements and enhances their skills. Protection of learner privacy was also toughed on.

Usable e-learning courses are designed to assist learners in achieving their educational objectives in the simplest, most user-friendly manner possible (Nielsen, 2000:[Online]). Poor usability should never be an obstacle when learning takes place. Website developers should work towards providing e-learning courses that are "efficient, satisfying, transparent to the user and fun to use" (Switzer, 2002:[Online]). However, Nielsen (2003c:[Online]) is of the view that "many Web-based courses suffer from weak web design and poor usability".

It is generally agreed that the application of certain established usability guidelines can improve any design. However, it is important to recognise that no two websites or their target audiences are the same. Therefore, the subject of each usability project should be treated as unique (Preston, No date:[Online]). Applying good usability principles in the context of well-structured instructional design and facilitation will go a long way towards making learning a successful and an enjoyable experience (Nielsen (2003c:[Online]).

Table 2.21 and Table 2.22 identify key issues with regard to web usability. A number of the issues listed in the two tables below overlap with those listed in Table 2.17, Table 2.18 and Table 2.19. However, the issues listed and Table 2.21 and Table 2.22 are viewed more from a user perspective than from a design perspective. This information was drawn from various sources, and it includes comments about the usability principle in question. The tables cover, in very broad terms, various issues and important points about usability and website design.

The issues listed in Table 2.21 on the next page regarding web usability are visibility, learner control over navigation, simplicity and consistency, minimalist design, orientation/navigation, interactivity, prevention of and recovery from errors and building flexible and efficient web pages. The rationale behind each of these issues is also given.

Table 2.21: Usability issues and website design (Katz-Haas, 2001:[Online]; Lynch & Horton, 1999:11-25; Ambler, 2000:1; Smulders, 2001:[Online;] Switzer, 2002:[Online]; Nielsen 2003b:[Online])

Issues	Rationale
Visibility	• Course elements, like those that aid learners' navigation, should be highly visible, obvious and (ideally) intuitive. • Using highlighted text and emphasis to make important words catch the learners' eyes. Hypertext anchors should stand out by virtue of being blue and underlined.
Give learners control of navigation	• If the design is clear and unambiguous, learners will find their own way around a web environment. • Limit the necessity for linear navigation. Do learners have to click through half of each module before reaching an assessment?
Simplicity and consistency	• Keep the number of actions and objects to a minimum. • All units or pages should have the same basic layout grids, graphic themes, editorial conventions and hierarchies of organisation. Consistency in design permits learners to build an accurate mental model of the way in which the site works. These models help learners to predict the effect(s) of their actions. Accurate mental models lead to lower training and support costs.
Consider using a minimalist design	• Apply a clean, clear design. Such designs are not only aesthetically pleasing, they are also efficient for learners. Although exciting and exotic design features might be fun for a single visit, such features distract from the learning process.
Orientation/ navigation	• Learner interaction with web pages mostly involves navigating hypertext links between documents. Learners often report that they don't know where they are within the local organisation of the information. There are a number of means that one can use to help learners to orientate themselves. These include the following procedures: - Make links sufficiently descriptive so that learners can easily predict what they will find when they click a particular link - Learners should be able to visualise the site's structure. - There should be no *dead end* pages from which learners cannot exit.
Interactivity	• There is a strong correlation in course assessments between learner satisfaction and interactivity. The design goal should be interactivity between learners, learners and the instructor, learners and the course tools and content, and learners and outside-the-course websites. More than colour, graphics, animation, or any other high-tech elements in a course, interactivity in a website ensures increased usability and learner satisfaction. Interactivity therefore may be rated as a vital element of design.
Prevent errors	• Aim to be error-free, up-to-date, and relevant. • Check for scripting errors and whether links are current.
Recovery from errors	• Help learners to recognise, diagnose, and recover from errors. • Provide documentation, troubleshooting advice for potential problems, links to technical support and contact information.
Build flexible and efficient web pages	• Accommodate learners who need to print documents by providing printer-friendly, graphics-free pages. • Keep web pages, graphics, and downloaded files to a reasonable size. • Although a small amount of coloured text enhances usability, a variety of coloured text will detract.

Table 2.21 summarised the rationale behind a number of usability issues. A learning website should be designed in such a way that learners will be able to navigate it with ease. An optimal learning website has instructional aids that are visible, obvious, and – ideally – intuitive. The usability of a website is enhanced if its design tends towards minimalism rather than over-elaboration and if the necessary functionalities are applied consistently throughout the site. Such a site should also enable interactivity between learners and the course content, other websites outside the course itself and additional course content on the Internet. The website should be as free from errors as possible and should provide support if errors do occur. The next table lists further issues relating to web usability that need to be considered when an educational website is being designed.

The usability issues listed in Table 2.22 on the next page, include the audience, learner satisfaction, accessibility, system feedback, instructor feedback, speedy downloads and connection and resolution independent design. The rationale behind each of these issues is also given.

Table 2.22: Usability and website design (Continued) (Katz-Haas, 2001:[Online]; Lynch & Horton, 1999:11-25; Ambler, 2000:1; Smulders, 2001:[Online;] Switzer, 2002:[Online]; Nielsen 2003b:[Online])

Issues	Rationale
Audience	Understand your target audience and match content to audience.
Learners satisfaction	The site should be pleasant to use and look at. Learners' perception of what is "pleasant" influences their: • perception of ease-of-use • motivation for learning how to use the site • confidence in the reliability of the site's information

Accessibility	Assist learners to find information quickly and easily by:
	• clearly indicating to learners where they are situated within the broader context of an learning website.
	• clearly naming links.
	• providing learners with more than one option for finding information (navigation elements, search functions, site maps). Do not, however, provide too many options at once because many users find that confusing or intimidating.
	• "chunking" material. A key to good instructional design is to *chunk* material into small workable sections that can be accessed easily quickly.
	• creating a design that facilitates and encourage skimming. Provide clues that allow learners to find a *nugget of information* by *scanning* the content rather than reading it.
	• Support skimming by:
	  - structuring content with two or three levels of headings.
	  - using clear, meaningful headings.
	• Bulleted lists and similar design elements should be used to break the flow of uniform text blocks.

System feedback	When a learner performs an action, she or he should receive immediate feedback. For example, when the learner clicks a button, something on the screen should change so that the learner knows the system has registered the action.
Facilitator feedback	Assessments show that many learners report that a "good" e-learning course provides them with quantitatively more, qualitatively better, timely instructor feedback than they commonly receive in traditional classroom settings. Effective, highly rated instructors are those who participate in discussions, provide feedback on assignments and assessments, and are accessible through e-mail or office-hour, chat rooms or discussion sites.
Speedy downloads and connection	Websites must be designed to connect and download speedily. Speed must be the overriding design criterion. In order to keep pages small, a limited number of graphics and multimedia effects should be used – and then only when they truly add to the learners' understanding of the content. When you use graphics, apply multiple occurrences of the *same* image rather than different images. A subsequent instance of the same image will render quickly because the image will be in the learner's local cache. Per page image reuse implies smaller, decorative images such as buttons and icons.

Table 2.22 summarised the rationale behind a number of usability issues. These include the importance of knowing your target audience and adjusting the content to match the audience. By designing a website that is pleasant to look at and use will achieve increased learner satisfaction which in turn will influence their perception of ease-of-use, their motivation for learning how to use the site and their confidence in the reliability of the site's information. A website that assist learners in finding information quickly and easily by making use of features such as providing two or more options of finding the relevant information, chunking and features that encourage skimming, all contribute to the usability of a website. The website should provide immediate feedback, for instance when a learner clicks on a button the next page must appear. Timely and consistent feedback and participation from the facilitator is also important. A very important usability feature is speed. Websites must be designed to connect and download speedily.

Although what has been discussed above provides general information about users and user/web interaction, it is still insufficient to make a particular site usable. It therefore remains crucial to determine how particular users will interact with a particular site when one is attempting accurately to assess actual (practical) usability.

The nutrition and HIV and AIDS learning website will include all established usability guidelines. By doing this, one can establish how the adult learners from previously disadvantaged communities will experience the learning website and its usability and then identify if these established usability guidelines are applicable (or not) to the target group. For example, adult learners with limited computer skills may experience navigational difficulties that are different from younger and more computer-literate learners. Since older adults have not been exposed to computer technology since childhood they may not find working on a computer and, using a mouse and navigating through a website as easy and intuitive as would a younger generation. The learning website should therefore be designed in such a way that adult learners will find it rewarding to use.

The study needs to investigate whether: (1) Learners find the website intuitive, easy and enjoyable to use. Poor navigation tools and insufficient instructions can confuse and disorientate learners. If learners find the website even slightly difficult to navigate, and they do not know what to do or where they are, they will most probably not use the website because if electronic media are so unfamiliar to them, they would find it much easier to return to the paper format with which they are familiar. (2) The website has the necessary functionalities and whether they are applied consistently throughout the site. If these functionalities are inconsistent, they would cause confusion and learners would be reluctant to use the website since they are never sure where a button or link will take them. (3) Learners find the course content both useful and current. Boring and irrelevant content can cause lack of interest and increase the possibility that learners will fail or discontinue the course. (4) The learning website is well structured and organised. If the content is divided into subsections that are confusingly labelled, learners will perceive the sections as being overwhelming and unintelligible. They will become discouraged and lose interest in the course work, score low marks in their

assignments, and even fail the course. (5) The learning website provides links to other pages and websites that contain relevant information, and whether it will allow learners to switch effortlessly back and forth between topics. If the website has errors and broken links, and learners are not able to recover easily, this will confuse them. Learners will feel they are unable to find information, that it is not worth their effort, and they will stop using the website.

The study of Abels et al. (1998:42) on the identification of optimal user-based criteria for web page design, identified which web page features most influenced users when they came to the point of deciding whether or not to use a site. Table 2.23 on the next page arranges the criteria according to ranked order under broad categories. The criteria include usability, content, structure, linkage, search and appearance. Positive and negative features (where applicable) associated with the criteria are also listed.

Table 2.23: Criteria that users adopted for deciding whether or not to use a web site (Abels et al., 1998:42)

Criteria	Positive features	Negative features
Usability	• Ease of use • Ease of navigation through appropriate structures • Ability to get an overview of site structure	• Navigation problems • Users get lost easily
Content	• Useful information • Current information • Concise, non-repetitive information • Information not easily or readily found in library collections	• Superficial information • Uninformative content • Advertisements • Repetitious content • Boring text • Lack of current information
Structure	• Well organised • Intelligible • Straightforward • Mediated through text that is broken up into accessible units (chunking) • Innovative in presentation and organisation	• Contains text that is too long • Divided into confusingly labelled subsections
Linkage	• Linked to pages/sites that provide relevant information • Ability to switch back and forth between topics	• Broken links • Linked to sites/pages that are marked "under construction"
Search	• Search support • Search provides a list of helpful sites or pages • Minimum processing time to deliver	
Appearance	• Visually attractive • Printable – without too many overly-darkened areas • Graphics are not essential to site use	

Table 2.23 listed the positive and negative features (where applicable) of the criteria that users adopted for deciding whether or not to use a web site. Features include the ease of use, do users experience navigation problems, how current and informative is the content, is the website well structured with text broken up into accessible units. Is the website pages linked to other relevant

pages or websites or are the links broken. How visually attractive is the website and how printable are the site pages.

As the benefits of user-centred design (UCD) and usability testing are more widely acknowledged, usability is beginning to emerge as one of the most important design features to consider when building an online presence. It has been argued that the UCD process increases costs but provides no real benefits. This is not true. By early and specific investment in the time that is needed to **design for usability**, organisations find that they benefit at later stages of development by saving both time and money. The UCD framework has been proven time and time again to deliver user-friendly products (Preston, No date:[Online]).

❑ **Conclusion**

When designing and developing the nutrition and HIV and AIDS website, one should incorporate features that promoted ease of use, flexibility and efficiency. Throughout the design and develop process, usability criteria should be considered to assess the navigability and other attributes of the website interfaces. Attributes that are used for assessing the website included learner control over navigation, simplicity and consistency, minimalist design, orientation/navigation, interactivity, prevention of errors and reversal of errors. Chapter 3 and chapter 4 give detailed descriptions of how I tested the usability of the website and what the learners' responses were to questions that tested usability.

In the next section, theoretical perspectives and adult learner perceptions about acceptance, motivation and the utilisation of the Internet and computer technology as a training tool, will be discussed.

2.2.6 Theoretical perspectives and adult learner perceptions

Research Question 6
What theoretical perspectives and adult learner perceptions play a role in the acceptance and utilisation of the Internet and e-learning and as training tools?

Although advances in technology have opened up new possibilities for education, the use of new media requires new approaches to teaching – one of which is the consideration of a range of theoretical perspectives when implementing technology in teaching and learning (Koyanagi, (No date):[Online]; Deubel, 2003:[Online]).

The two primary theoretical perspectives in the field of learning and interactive courseware are behaviourism and cognitivism (Atkins, 1993:251; Hannafin, et al., 1996:378). Current trends in education and training appear to have moved from an underlying objectivist model derived from behavioural psychology to a constructivist model based on cognitive psychology.

Early computer-based materials were developed to reflect a behaviourist philosophy that assumed that behaviour could best be developed and modified by consequences such as rewards and punishments. The current trend towards discovery learning is predicated on information processing theory and a constructivism that is based on cognitive psychology. Constructivism promotes adult learning, self-directed learning and active learning (Deubel 2003:[Online]; Koyanagi, (No date):[Online]). The rise to eminence of cognitive approaches from the 1980s onwards may be attributed both to the increasing influence in psychology of cognitive theorists just as much as to technological developments such as object-oriented programming, hypermedia, and interactive video (Atkins, 1993:252).

Table 2.24 on the next page lists the differences between objectivism and constructivism. The elements used to indicate some of the differences are theoretical basis, description of main tenets, method and approach.

Table 2.24: Some differences between objectivism and constructivism (Deubel 2003:[Online]; Koyanagi, (No date):[Online])

Element	Objectivism	Constructivism (Active learning and adult learning)
Theoretical basis	Behavioural psychology	Cognitive psychology
Description of main tenets	• Psychology is based on observable behaviour. • Behaviour is determined by outcomes/consequences. • Knowledge is manifested in behaviour (correct answers).	• The learner is an active processor of information (the computer-based model). • The emphasis is on internal mental states. • The perspectives, experience, knowledge and interests of the learners are regarded as being of critical importance.
Method	• Present content. • Put questions to learners. • Tell the learner if answer is correct or not. • Positively reinforce correct answers. • Repeat the cycle when answers are incorrect.	• Encourage knowledge formation. • Recognise that the process will be different for each learner. • Encourage self-directed exploration. • Encourage discovery learning. • Encourage the learner to construct concepts, schemas and mental models.
Approach	• Authoritative truths and knowledge are supplied for learners to memorise. • The teacher controls the process. • The learner learns (adopts) the authoritative meaning.	• Truth and knowledge is constructed by learners on the basis of their perspective and experience. • The facilitator observes, and only coaches and facilitates if he or she is required to do so (i.e. when the learner needs help). • Learners create their own meanings.

Table 2.24 indicated some differences between objectivism and constructivism. Objectivism has its theoretical basis in the behavioural psychology while constructivism has its theoretical basis in the cognitive psychology. The table summarizes the principles of each of the theories on how learners gain their knowledge. The approach is concerned with how the two theories approach the gaining of truths and knowledge and who is in control of the process and how learners attach meaning to the content.

Website designers need strategies that will help them to organise instructional material in an optimal way. Such strategies are based on a psychological theory of how people learn (Hoffman, 1997:58).

The user interface is the central locus of e-learning because it is here that all elements of e-learning are combined (for better or for worse) and where the interrelationships among elements of subject matter content are demonstrated. An effective interface design will therefore enable the learning experience by extending the knowledge and expertise that a learner will retain (Vilamil-Casanova & Molina, 1996, in Deubel, 2003:[Online]). All interfaces are based on theories and learning principles that the designer implements in practice. According to Ally (2004:6) one should be familiar with the different approaches to learning and select the most appropriate instructional strategies from a combination of learning theories when developing learning material. "Learning strategies should be selected to motivate learners, facilitate deep processing, build the whole person, cater for individual differences, promote meaningful learning, encourage interaction, provide feedback, facilitate contextual learning, and provide support during the learning process." (Ally, 2004:6). I have identified three learning theories that can be applied to enhance the nutrition and HIV and AIDS online teaching and training materials. The three learning theories are listed below:

- Gagne's Conditions of Learning Theory

- Carroll's Minimalist Theory

- Vygotsky's Theory of Social Cognitive Development

The question that needs to be answered is: How can these three theories be applied to the nutrition and HIV and AIDS learning website so that adult learners from previously disadvantaged communities can construct their own knowledge about nutrition and HIV and AIDS and acquire the skills that they need to provide nutritional care and support to the PLWHA in their communities.

Below are three tables that summarise the three learning theories and that show how each learning theory can be applied to enhance online teaching and training materials.

Table 2.25 on the next page summarizes Gagne's Conditions of Learning Theory. The summary covers the following sections: a description of the learning theory, an example of how the theory and related strategies can be applied to a particular instructional objective or web-design problem and a list of related pedagogical and web-design strategies from the literature.

Table 2.25: Gagne's Conditions of Learning Theory (Kearsley, 1994a & b:[Online]; Jonassen et al.,1997:122; Patsula, 1999:[Online])

Theory	Description	Practical application	Related theories, pedagogical and web-design strategies
Gagne's Conditions of Learning Theory	Although Gagne's theoretical framework covers many other aspects of learning, the theory focuses on intellectual skills. He identified five major types of learning levels, namely verbal information, intellectual skills, cognitive strategies, motor skills and attitudes. Each requires different internal and external conditions. Gagne contends that learning tasks for intellectual skills can be organised in a hierarchy that is based on criteria that demonstrate increased complexity in stimulus recognition, discrimination response, concept generation, formation procedure, rule application, the use of terminology and problem solving. This hierarchy is vitally important because it provides instructors with directions on how to distinguish conditions that should be achieved to facilitate learning at each level. It also provides support for sequencing instruction. Gagne outlines the following nine instructional events and corresponding cognitive processes: • Gaining attention (reception) • Informing learners of the objective (expectancy) • Stimulating recall of prior learning (retrieval) • Presenting the stimulus (selective perception) • Providing learning guidance (semantic encoding) • Eliciting performance (responding) • Providing feedback (reinforcement) • Assessing performance (retrieval) • Enhancing retention and transfer (generalisation)	The nine instructional events and corresponding cognitive processes can serve as the basis for the process of designing instruction and selecting appropriate media. The principles that need to be considered are the following: Learning hierarchies define a sequence of instruction. Learning hierarchies define what intellectual skills need to be learned. Different instruction is required for different learning outcomes. ***Example*** The facilitator offers the treatment of nutrition-related symptoms of HIV and AIDS as an example in order to show how Gagne's nine instructional events may be applied. Instructional objective The treatment of nutrition-related symptoms of HIV and AIDS Methodology **Gain attention** – **List** nutritional related symptoms. **Identify objective by posing a question** – "What advice can you give to a person suffering from these nutrition related symptoms?" **Recall prior learning** – Review disease background and causes of symptoms. **Present stimulus** – Ask them what they will do when they are confronted by the symptoms. **Elicit performance** – Ask learners to provide nutritional advice related to the symptoms. **Provide feedback** – Check whether the examples are correct or incorrect. **Assess performance** – Provide scores and remediation. **Enhance retention/transfer** – Present a case study, and ask them to identify and discuss treatment of symptoms.	Provide a variety of learning activities. Accommodate learning styles by adopting various teaching and assessment methods. Provide other offline materials and activities, and present different points of view so that learners are given the opportunity to explore the intellectual landscape of the content domain by looking at it from multiple perspectives. Use Bloom's "Taxonomy of Educational Objectives for the Cognitive Domain" to increase retention. Bloom outlines the following cognitive activities (an example from the topic is included with each one): **Knowledge**: Know enough about food to identify the nutrients provided by the various foods groups. **Comprehension**: Identify the nutrients provided by one food group and distinguish it from other food groups and what they provide. **Application**: Eat certain foods to provide specific nutrients. **Analysis**: Determine what food should be eaten by PLWHA. **Synthesis**: Compare the nutritional needs for the different stages of HIV and AIDS. **Evaluation** (making judgements): Assess the nutritional status of the client, identify related symptoms and make recommendations on treatment.

Table 2.25 summarized Gagne's Conditions of Learning Theory in three sections. In the section under the heading *Description*, Gagne's conditions of learning theory and what it entails is described. The focus of the theory is on intellectual skills and lists the five major types of learning levels that Gagne identified. Gagne contends that learning tasks for intellectual skills can be organised in a hierarchy based certain criteria. This hierarchy is important because it provides instructors with directions on how to distinguish conditions that should be achieved to facilitate learning at each level as well as providing support for sequencing instruction. The nine instructional events and corresponding cognitive processes outlined by Gagne are also listed.

Under the heading *Practical applications,* it is indicated how the theory is applied in practice by using the nine instructional events and corresponding cognitive processes as the basis for the process of designing instruction and selecting appropriate media. I have given an example of an assignment question on PLWHA and the treatment of nutrition related symptoms and how the nine instructional events are applied. I need to establish if the instructional design and the learning website as medium are appropriate means of applying Gagne's theory and if it is suited to teach adult learners about nutrition and HIV and AIDS as well as the relevant skills they need.

Under the heading *Related theories, pedagogical and web-design strategies*, a summary is given on how to provide a variety of learning activities and to use Bloom's "Taxonomy of Educational Objectives for the Cognitive Domain" to increase retention. I have also included relevant examples of how Bloom's taxonomy is applied to cognitive activities in relation to nutrition and HIV and AIDS. I need to establish if the related theories, pedagogical and web design strategies that were applied to the nutrition and HIV and AIDS learning website are relevant to the adult learners and their needs.

The next table summarizes Carroll's Minimalist Theory and how it can be applied to improve online learning and teaching.

Table 2.26 on the next page summarizes Carroll's Minimalist Theory. The summary covers the following sections: a description of the learning theory, an example of how the theory and related strategies can be applied to a particular instructional objective or web-design problem and a list of related pedagogical and web-design strategies from the literature.

Table 2.26: Carroll's Minimalist Theory (Kearsley 1994c:[Online]; Patsula, 1999:[Online]).

Theory	Description	Practical application	Related theories, pedagogical practices and web-design strategies
Carroll's Minimalist Theory	Carroll's Minimalist Theory is concerned with the instructional design of computer training materials. The theory suggests the implementation of the following procedures: • All learning activities should be meaningful and self-contained. • Activities should exploit the learner's prior experience and knowledge. • Learners should be given realistic projects as soon as appropriately possible. • Instruction should permit self-directed reasoning and improvisation. • Training materials and activities should provide for error recognition and should use errors as learning opportunities. • There should be a close linkage between training and the actual system because "new users are always learning computer methods in the context of specific pre-existing goals and expectations". The critical idea behind the minimalist theory is that course designers must "minimize the extent to which instructional materials obstruct learning and focus the design on activities that support learner-directed activity and accomplishment" (Kearsley 1994c).	Learners should be able *immediately* to work on meaningful tasks. Minimise the amount of reading and other passive forms of training by allowing users to fill in the gaps themselves. Include error recognition and recovery activities in the instruction. Make all learning activities self-contained and independent of sequence. Make sure that important information is at the top of the web page, so learners don't have to scroll too much. Web-design should minimize the extent to which instructional materials obstruct learning. Text design, graphics and sound should be simple and consistent. This will prevent cognitive overload. Web pages must not be "cluttered", and they should download in 30 seconds or less. Non-essential content should be removed or shrunk in size. Limit text colours. Backgrounds should support readability.	Keep important information at the top of the page. Good web design demands that learners are provided with the information they want immediately. Limit cognitive overload, and be consistent in design of text, graphics and sound. Keep pages uncluttered by removing excess elements (see Table 2.18: Aspects of user interface design, on keeping web pages simple). Strive for quality not quantity. Keep the following points in mind when designing e-learning courses: Design small. Make what you have effective, and then add to it. Don't attempt to do everything at once. Keep effects simple. Ensure that effects add to the message/content. Map out the *whole* site (both for development and maintenance). Plan for growth. Anticipate and direct it. Get feedback from users. Test any outside links regularly. Do not post any part of a site while it is still *under construction*. Everything on your site should work once it is available to learners. Instead of "Under construction", put up notices that announce new features that will soon appear.

Table 2.26 gave a summary Carroll's Minimalist Theory and what it entails. In the section *Description,* a summary is given of Carroll's Minimalist Theory and what the theory suggests concerning the implementation of procedures associated with the instructional design of computer training materials. Under P*ractical applications* some instructional design guidelines are given that need to be applied when designing computer training materials. The heading *Related theories, pedagogical practices and web-design strategies,* lists features concerning user interface design and keeping web pages simple.

The study needs to investigate how Carroll's Minimalist Theory can be applied to the nutrition and HIV and AIDS learning website and how the instructional design of the training website meets the needs of adult learners with limited nutrition knowledge. The features that need to be included are: (1) implementing meaningful and self-contained learning activities that exploit learners' prior experience and knowledge, (2) giving learners realistic projects that encourage self-directed reasoning and improvisation, (3) constructing activities that provide for error-recognition and correction. The learning website should be designed in such a manner that it supports these activities by, for instance, inserting links to important information at the top of the web page and by limiting cognitive overload by applying design elements that are simple and consistent.

The next table summarizes Vygotsky's Theory of Social Cognitive Development and how it can be applied to enhance online learning and teaching.

 Table 2.27 on the next page summarizes Vygotsky's Theory of Social Cognitive Development. The summary covers the following sections: a description of the learning theory, an example of how the theory and related strategies can be applied to a particular instructional objective or web-design problem and a list of related pedagogical and web-design strategies from the literature.

Table 2.27:   Vygotsky's Theory of Social Cognitive Development (Kearsley 1994d:[Online]; Gillani & Relan, 1997:231- 232; Patsula, 1999:[Online])

Theory	Description	Practical application	Related theories, pedagogical practices and web-design strategies
Vygotsky's Theory of Social Cognitive Development	This theory is concerned with the fact that "social interaction plays a fundamental role in the development of cognition" (Kearsley 1994d). Gillani and Relan (1997:232) proposed the following four phase instructional design model on the basis of Vygotsky's instructional tools and four learning stages: • advance organiser phase • modelling phase • exploring phase • generating phase One of the distinguishing features of this theory is that it claims "that instruction is most efficient when learners engage in activities within a supportive learning environment and when they receive appropriate guidance that is mediated by tools" (Vygotsky 1978, in Gillani & Relan 1997, 231). Instructional tools can be defined as cognitive strategies, a mentor, peers, computers, printed materials, or any instrument that organises and provides information for the learner. Such "tools" help learners to complete a task by organising dynamic support – and then withdrawing support systematically as learner confidence increases.	In applying the theory of social cognitive development, keep the following principles in mind: Full cognitive development requires social interaction. Cognitive development is limited to a certain range at any given age. **Application** "The interactive nature of frames in interdisciplinary instructional design has the potential of implementing cognitive theories as its theoretical foundation" (Gillani & Relan, 1997:232). The following model that contains four distinct web page frames is proposed: **Vibrant frame** – This is a small frame in the top-left area. It describes the current content theme. When it is clicked, a new theme appears, thus changing the thematic nature of instruction. **Instructional model frame** – This frame is at the top-right. It includes four buttons that represent the four stages of learning: **Advance Organiser**, **Modelling**, **Exploring**, and **Generating**. Each button in this frame updates and controls the content of the navigation frame. **Navigation Frame** – This frame is on the left, below the vibrant frame. The button that is clicked in the navigation frame determines the content of the presentation frame. **The Presentation Frame –** This is the main central frame. It displays whatever dynamic instructional content has been selected from the navigation frame.	Simplify navigation. Create effective menus. Clearly identify content with appropriate headings and titles. Place the most important information on the top-left.

Table 2.27 gave a summary of Vygotsky's Theory of Social Cognitive Development and what it entails. In the section *Description,* a summary is given of the theory and of the instructional tools that help learners to complete a task by organising dynamic support. Under the heading P*ractical applications*, four principles are listed concerning the application of the theory of social cognitive development. An example of how the theory can be applied is then given. The heading *Related theories, pedagogical practices and web-design strategies,* instructional design guidelines are listed that need to be considered when designing web based training material.

The nutrition and HIV and AIDS website design implements the model of web page frames that is proposed in Vygotsky's Theory of Social Cognitive Development. The study needs to investigate whether the application of Vygotsky's Theory of Social Cognitive Development to the nutrition and HIV and AIDS learning website provides a supportive learning environment for adult learners with limited nutrition knowledge. I need to establish whether the application of frames to the website brings about interactive engagement with the website or whether it causes confusion that may induce in learners an unwillingness to use the website.

Although information technology has become part of many peoples' daily activities, it seems as if the potential of the www as an aid to learning and training may not as yet have been fully realised. One of the main reasons why people under-utilise the www is because of their unwillingness to accept and use technologies to their disposal. Low levels of computer acceptance and use appear to have their roots in a fear of computers, a resistance to new technologies, the belief that such technologies are difficult to use, a failure to understand just how important such technology is, and a lack of motivation to adopt new technology (Liaw, 2001:50). Similar inhibitions also prevent adult learners from maximising the potential of the web for learning purposes.

In the next section, I will propose a model that links various aspects of users' perception of web technology as a training tool. The model reviews users' attitudes toward web-based environments in a way that integrates the Technology Acceptance Model (TAM), Social Cognitive Theory (SCT), motivational perspective, a self-efficacy perspective, and the possibility of developing new user perceptions towards the acceptance and use of web-based technology. The model will provide some insight into why some learners will more readily accept the Internet and computer technology as training tool than others. The various components of the model are summarised below.

❑   **Theoretical perspective**

There are a number of theoretical perspectives on how adult learners behave when they have to use technology. The Technology Acceptance Model, Social Cognitive Theory, motivation self-efficacy and attitude are discussed as factors that can pay a role in adult learn behaviour.

- **Technology Acceptance Model (TAM)**

TAM proposes that perceived ease of use (EOU) and perceived usefulness (U), two behavioural beliefs, influence the behavioural intention of an individual to use technologies (Liaw, 2001:50). Perceived *ease of use* is the extent to which a person believes that use of a technology will be relatively straightforward, comprehensible, manageable and free from problems that will force the user to terminate his or her attempts to use the technology concerned. *Perceived usefulness* is the extent to which a person believes that his or her productivity will be enhanced through the use of technology (Vankatesh, 1999:239). Perceived usefulness is viewed as an outcome, and the behavioural intention to use a technology will lead to actual use of the system. Studies have indicated that a determination to engage in a behaviour is strongly affected by the perceived usefulness of the outcome (Liaw, 2001:50).

- **Social Cognitive Theory (SCT)**

SCT postulates that environmental influences, such as cognitive and other personal factors, including personality and/or demographic characteristics, social pressures or unique situational characteristics, and behaviour, are reciprocally determined (Bandura, 1986:408; Compeau & Higgins, 1995:118). The two expectations that SCT incorporates are outcome expectations and expectations-related self-efficacy, where both are determinants of user behaviour (Igbaria & Olivari, 1995). Outcome expectations correspond with the perceived usefulness in TAM, where users are motivated to practise those behaviours that they believe will help them do their work better. "Self-efficacy refers to beliefs in one's capabilities to mobilize the motivation, cognitive resources, and courses of action needed to meet given situational demands" (Bandura, 1986:408). Research has shown that first-year female university learners have lower self-efficacy beliefs in respect to computing in general than male learners, as well as between disadvantaged and advantaged learners (Galpin, 2003:44). A South African study on matric learners found that female learner attitudes towards computer use were more negative than that of males but when people use computers their perception of computers become more positive and this played a bigger role than gender (Moore, 1994:26).

- **Motivation**

Motivation has been widely used as a way of explaining and understanding individual behaviour. The intention of users to use computers (i.e. the precondition for actually using a computer) is strongly affected by intrinsic and extrinsic motivations (Davis, Bagozzi, and Warshaw, 1992:1112). Intrinsic motivation is driven by the internal satisfaction and enjoyment gained from a specific activity (Vallerand, 1997:271), while extrinsic motivation is concerned with performing a behaviour to achieve a specific outside goal or reward (Deci & Ryan, 1987:1025). Studies have found that enjoyment (intrinsic factor) and a sense of usefulness (extrinsic factor) positively influence a person's intention to use information technology (Vankatesh, 1999:245; Igbaria, 1993:75).

- **Self-efficacy**

  Self-efficacy is defined as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997:3). Self-efficacy is therefore seen as a consequence of learning processes. Murphy, et al., (1989:893) described computer self-efficacy as an individual's perception of his or her capabilities with regard to specific computer knowledge and skills.

- **Attitude**

  "Attitude can be defined as the way an individual feels about and is disposed toward some objects" (Liaw, 2001:51). Two factors shape attitudes towards computers: the belief that computers are beneficial tools and that they are autonomous entities (Brock & Sulsky (1994:17).

  It is been suggested that *attitude* consists of the following components:
  - Affective component: Emotion or feelings, including statements of likes or dislikes about specific objects.
  - Cognitive component: A belief statement. The belief an individual holds that a particular item can increase the quality of personal output.
  - Behavioural component: What an individual actually does or intends to do (Al-Khaldi & Al-Jabri, 1998:24).

  Liaw (2001) developed the model shown in Table 2.28 that links individual intentions toward web technology, acceptance, and use. This model integrates the TAM, SCT, attitude, motivation, and self-efficacy explanations.

Table 2.28: Constructs of web-based attitudes (Liaw, 2001)

Construct	Description	Measurement
Computer and web experience	Computer and Internet/www use and experiences	Behavioural
Web-based self-efficacy	Learner confidence to use or learn about the Internet/www	Cognitive
Web-based usefulness	The degree of perceived usefulness of using the Internet/www for present and future work	Cognitive
Web-based enjoyment	Liking or enjoying working with the Internet/www	Affective
Behavioural intention to use the web	The degree of intentions of learning or using the Internet/www for present and future work	Cognitive

Liaw (2001:52) made the following correlations on the basis of numerous research findings and the acceptance model:

- The greater an individual's computer experience, the greater will be his/her web-based self-efficacy.
- The greater an individual's web-based self-efficacy, the greater will be her/his use of the web.
- The greater an individual's web-based self-efficacy, the greater will be her/his liking (or enjoyment) of web use.
- The greater the individual's liking for web-based use, the greater will be her/his intention to use the web.
- The more frequent an individual's use of the web, the more frequent will be her/his intention to use the web.

It is recommended that trainers, teachers and instructors of e-learning courses would benefit from being more attentive to learners' perceptions toward the web environment. Key factors in learners' use of the web are computer and web experience, self-competence and motivation (including intrinsic and extrinsic motivation). If facilitators and teachers are aware of these factors they can plan in instructional time and activities to strengthen the skills of those with weaker computer skills (Liaw, 2001:53).

❑ Conclusion

As indicated by the discussion above, there are learning theories that need to be considered when implementing technology in teaching and learning. If these theories are thoughtfully implemented, while considering the theoretical perspectives that provide a basis for understanding adult learner acceptance and utilization of the Internet and computer technology as a training tool, situations can be created in which learners will be given opportunities to explore the usefulness of the Internet and computers for their studies. To achieve the acceptance and utilization of the Internet and computers, instruction materials and activities should be developed and designed so that they support and encourage knowledge formation while developing learners' intellectual skills.

Adult learners from disadvantaged communities in rural areas are often not aware of the opportunities that the Internet and e-learning can offer them in accessing the information and offering them the support they need to succeed in their studies. They need to be exposed to the e-learning features of the course while the applications should prove to the learners that their initial reluctance about using the Internet and computers were unfounded and that using the Internet and computer technology to achieve their objectives and study goals is both enjoyable and profitable.

The next section will discuss what media and technology are best suited for the delivery of distance education.

2.2.7 Suitable media and technology for the delivery of distance education

Research Question 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?

There is a wide range of technologies available for delivering distance education materials. However, applying some of these modes of delivery in practice is not always possible, given the conditions and situation in many developing countries. If one wants to make an informed choice about which technologies one will use for education and learning, one must (1) review their advantages and limitations, (2) determine whether the infrastructure exists to support them adequately, and (3) examine what it will cost to use such technologies (Perraton et al., 2002:38). From a technical point of view, the application of various media requires the ability to manipulate media that can deliver text, audio, video and animations. From the educational side, the use of a combination of media should be interactive – stimulating an active process between a learner and subject matter (Ali Habash, 1998:[Online]).

There is no single answer to this question "Which technology is the best?" To begin with, one's choice of technology must take cognisance of the fact that no one medium is inherently more effective than another. Research has shown that there is no significant difference in the effectiveness of various media when it comes to teaching the same subject matter (Clark, 1994). Technologies should be chosen on the grounds of their appropriateness, convenience and cost. It is likely that using a *combination* of media for teaching would be more effective than any single medium. Practical considerations support this argument. If therefore (for example) content is available on both the Internet and in print, a learner will have an alternative medium to use (say) if the printed version turns up late or gets lost in the post. The prudent application of a mix of media that exploits the idiosyncratic strength and minimises the limitations of each medium, is most likely to produce good results (Perraton et al., 2002:38).

The table on the next two pages will provide a summary of a number of media and technology that can be used in distance education and the most important advantages and limitations of a number of media and technology that are used for the delivery of distance educations (Cloete et al., 2003:232; Cypress Lake Studios, 2003:[Online]; Forsyth, 2001:49; Perraton, 2002:40-43; Shih et al., 2003:1; UCISA, (No date):[Online]; Van Brakel & Chisenga, 2003:479; Wang & Liu 2003])

Table 2.29 on the next two pages lists the most important advantages and limitations of a print-, telecommunication-, audio-visual- and audio-based media, as well as computer-, www, visual- and human-based media as modes of delivery of distance education.

Table 2.29: Advantages and limitations of a range of technologies used for distance education (Forsyth, 2001:49; Perraton, 2002:40-43; Cypress Lake Studios, 2003:[Online]; UCISA, (No date):[Online])

Medium and Technology	Advantages	Limitations
• Print-based • Study guides • Readings • Assignments, both written and printed • Prescribed and recommended text books and literature	• Random access • Portable • Convenient to read, study and notate • Multiple copies available • Content is reliable and edited • Individual or group use • Includes a variety of resource material	• Bulky to store • Information limited by page space • Expensive to revise • Can become outdated • Fixed content that cannot respond quickly to sudden changes • Physical distribution can be slow, difficult, or fail • Delayed feedback
• Telecommunication-based • Video-conferencing	• Enables real-time interaction among learners and educators in different locations • Used for presentations, teaching sessions, discussions, learner support • Can make scarce expertise widely available	• Has high start-up costs • Requires technical support • Requires learners to travel to a venue • The added costs of providing a visual dimension may not provide matching benefits over audio-alone
• Telecommunication-based • Telephone • Facsimile	• Easy to use • Most people have one or have access to one • Immediate feedback	• Long distance and duration can be costly • Requires technical support •
• Internet	• Easy to use • Interactive • Immediate feedback	• Not every one has access • Duration can be costly • Requires training for effective use • Requires technical support • Hardware-intensive • Infrastructure-intensive
• Audio-visual-based • Video • Film	• Demonstrates and explains processes well • Broadcasting can be cost effective for large groups or multiple locations • Can provide close analysis of separate segments of different parts of the materials • Can support active learning with good instructional design	• Portable: requires bulky equipment • Requires large storage space • Information limited by time format • Not indexable or searchable • Difficult to actually *study* a tape • High production costs • Always vulnerable to the risks of technical malfunction
• Audio-based • Audio-cassette tapes • CD Audio	• Illustrations through sound • Offers a permanent resource for individuals or groups • Portable • Cassette players are usually widely accessible • Can be re-played, stopped and started at will • Inexpensive to develop and duplicate • Tutors can give feedback	• Audio-cassettes deteriorate over time and/or with extensive use • Sound quality can be poor • Cassettes need good management • Can fail to stimulate active learning if they are used only to deliver lectures • Requires skilled integration with other media • A one-way medium

Table 2.29 Continued: Advantages and limitations of a range of technologies used for distance education (Forsyth, 2001:49; Perraton, 2002:40-43; Cypress Lake Studios, 2003:[Online]; UCISA, (No date):[Online])

Medium and Technology	Advantages	Limitations
• Computer-based • Compact disk (CD) • DVD disk • Micro floppy disk •	• Provides access to information that can be conveyed by text, graphics, or in audio and video formats • Publishes logical "chunks" of information • Scales well: can be used for a group presentation or for self-paced learning • Repeatable and searchable • Large amounts of information can be stored on one disk • Cheap and simple to copy and distribute	• Disk portable but need computer to access • Reading from a screen for some period can be difficult and tiring • Learners may need training before use
• WWW- based • E-mail • Internet • Online documentation • Web-based training • Intranet training • Online help	• Provides a wide range of multimedia materials • Supports formal to informal interaction • Allows learners to participate in a large group • Permits the exchange of experience and materials • Unlimited access to information and assistance • Provides logical chunks of information • May be used for self-paced learning • Repeatable and searchable • Little storage space required	• Not always portable: Internet connection is required. Currently changing as wireless networks proliferate • Complex authoring stage. Some learning curve for the end user • Problems of access and cost • Requires a viable and adequate infrastructure • Requires change in teaching and learning perceptions and practices • Printing lengthy amounts of downloaded text becomes costly • Requires training for effective use • Requires technical support • The quality of learning programmes is sometimes poor
Visual-based • Graphs • Graphics • Photographs • Transparencies	• Enhance explanation • Accommodate visual learning styles	• A computer may not be powerful enough to download the visuals • Limited bandwidth increases downloading time • Productions may not be functional (only decorative)
Human-based • Lecturer • Facilitator • Face-to-face contact	• A good lecturer can convey a lot of information to a large number of learners in a short space of time and in an entertaining way. • Interactive • Possibility of immediate feedback	• As a medium, it relies mostly on the skill of the lecturer • Learners have little control over the pace of the lecture • A lecture does nothing to enhance the learners' practical experience • Not always available

Table 2.29 listed the advantages and limitations of a number of media and technology that are used for the delivery of distance educations. The more general advantages associated with the media and technology listed include, easy access and use, can be used more than once, supports interactivity,

provide real-time interaction of most of these media, the provision of access to information, interactivity and timely feedback. The more general limitations associated with the media and technology, are storage space, cost involved either with duplications or access, for effective use many of them requires training and/or technical support, some are not portable, they require a viable and adequate infrastructure and a change in teaching and learning perceptions and practices.

When considering using a combination of media and technology to teach a distance education course to adult learners from previously disadvantaged communities in the field of nutrition and HIV and AIDS, one should take into account what media are available at VUDEC and to what media learners are most likely to have access. By taking these factors into account, one can then make choices on the grounds of their appropriateness, convenience and cost. For instance, media such as DVD disks can be invaluable for facilitating learning, but they will have no value for this course if most learners do not own or have access to DVD players.

I am however of the view that one cannot argue that because many learners do not have access to computers or other kinds of technology, technology cannot be used for distance teaching and learning. One should rather make optimal use of the available media and technology and also use a combination of media and technology. In this way, learners with limited means will be able to use the paper-based format (which will still be the foundation format for distance education in South Africa for years to come), and all learners will have opportunities to be exposed to other kinds of media and technology. Vista University and Unisa have a number of learner support centres around the country. Most of these centres have computers (although not always in adequate numbers) available for use by learners. There are also tutors available at these centres to assist learners with their studies.

Study material, such as assignments, can be made available on the university's website in PDF (Portable Document Format) format. Learners will thus be able to access the material through the Internet. These PDF documents can be downloaded through the Acrobat Reader which is available free of charge on the Internet, and learners need not have access to any word-processing software (Vista University did not offer this facility, but Unisa is making the PDF format available from 2005). Courses offered through e-learning and the Internet give learners an alternative to the paper-based format of accessing their study material. Learners are provided with instant access to learning content after registration while they wait for the bulk of the material to arrive by post (a process that can sometimes take a number of weeks).

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 also eliminates the problems that arise because learners have left behind their study material in a taxi, or because their bags containing their study material got stolen, or because husbands destroy their wife's study material because friction induced by marital and/or social stress. Learners are then

able to access their study material through the Internet from work, home, university learner support centres, or an Internet café. This also eliminates the problem of the late submission of assignments due to the above reasons.

The nutrition and HIV and AIDS learning website will provide all the information that the paper format study guide provides (although it will presented in an non-linear e-learning format). But it will offer the following additional features: (1) The website will provide links to, for instance, the PDF format of a Department of Health document on nutrition and HIV and AIDS in Southern Africa. The learners using the paper format are advised to order the document from the Health Department. (2) The website will have links to other relevant websites and documents on basic nutrition and nutrition and HIV and AIDS. These documents are not provided in the paper format. (3) The website will have a variety of interactive quizzes that test learners' knowledge on basic nutrition. The quizzes also provide immediate feedback by automatically scoring the test after the learners has completed it. Learners using only the paper format do not have access to this means of assessment. Because to staff and time constraints, the facilitator cannot provide this facility on paper format.

Considering the advantages and limitations associated with various media and technology an example of a selection criteria matrix that can be used to determine the implementation of various media and technology and their role in teaching and learning is given in the table on the next page.

Table 2.30 on the next page reflects a selection criteria matrix that can be used to determine the implementation of various media and technology. The learning /teaching characteristics comprises Access: user; Audience: size; Cost: communication; Cost: start-up; Fidelity: audio; Fidelity: video; Instructional adaptability; Instructional methodology; Instructional strategy; Interaction: type/level; Learner outcome: knowledge, skills, attitude; Scheduling: asynchronous/synchronous; Support needed and Update capability.

Table 2.30: A selection criteria matrix that can be used to determine the implementation of various media and technologies (Schreiber, 1998:58-59)

Implementation: Learning/teaching characteristics	Printed material	Internet: Online courses; e-mail	Video conferencing (two-way)	CD-Rom	Audiotape/videotape
Access: User	Unconstrained distribution potential	Information dial-up (hardware/software compatibility)	Informal dial-up	Manual distribution (hardware/software)	Unconstrained (hardware needed)
Audience: Size	Unlimited	Asynchronous: Unlimited Synchronous: eight remote sites	Remote sites (18-20 learners per site)	Unlimited	Unlimited
Cost: Communication	N/a	Minimal	Low-medium	N/a	N/a
Cost: Start-up	Low	Organisational shared cost	Medium	Low-medium	Low
Fidelity: Audio	N/a	Low-medium fidelity sound	High-fidelity sound	High-fidelity sound	High-fidelity sound
Fidelity: Video	N/a	Low-medium fidelity motion	Medium-full motion	High-quality graphics	Full motion
Instructional Adaptability	Minimal support	Support	No support	Support remedial learning	Minimum support
Instructional Methodology	Self-paced	Student-centred and instructor-led	Student-centred and instructor-led	Self-paced	Self-paced
Instructional Strategy	Presentation of information	Information dissemination, Q&A, interactive discussion	Role-play, Q&A, interactive discussion, demonstration	Tutorial, drill & practice, simulation	Presentation of information
Interaction: Type/Level	N/a	Significant student-learner and learner-instructor	Significant; interaction can be between learner and learner/ learner and facilitator	Medium interaction Learners and materials	N/a
Learner Outcome: K, S, A	K	K, S, and/or A	K, S, and/or A	K, S, and/or A	K
Scheduling: Asynchronous/ synchronous	N/a	Asynchronous Synchronous	N/a Synchronous	N/a	N/a
Support Needed	N/a	Minimal	Minimal	Minimal	N/a
Update Capability	Inflexible	Just-in-time	Just-in -time	Medium flexibility	Inflexible

K = Knowledge, S = Skills, A = Attitude

Table 2.30 reflected a selection criteria matrix to determine the implementation of various technologies and media and their role in teaching and learning. The matrix evaluated Printed material, Internet: Online courses and e-mail, Video conferencing (two-way), CD Rom and Audiotape/videotape. Each of these media and technology were evaluated against the learning/teaching characteristics and how suited the medium is for teaching and learning.

❑ **Conclusion**

There is a variety of media and technology that can be used for the delivery of distance education to learners in the field of nutrition and HIV and AIDS. When choosing media and technologies, consideration should be given both to their educational advantages and limitations (as summarised in Tables 2.29 above), as well as to the prerequisites for their production, reproduction, distribution and use. Also important are questions about the availability and reliability of prerequisites because it is obviously pointless to produce good learning material if it cannot be distributed because of lack of access, shortages in particular kinds technical equipment, high cost involved, or because learners do not have the skills, training and experience to use them (Perraton, 2002:45).

Considering the limitations of the various media and technology the use of a combination of media and technology would bring about the most effective means of delivering distance education to all learners concerned.

The next section will discuss the design of a distance education course.

2.2.8 The design of a distance education course

> **Research Question 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?

The Internet heralded a new era in distance education by introducing sophisticated delivery tools and creating a paradigm shift with profound implications with regard to the design of distance education courses. This paradigm shift also ushered in new modes of teaching that necessitate the adjustment of instructional materials supported by different delivery media (Passerini & Granger, 2000:1). Although online learning and computer technologies offer many benefits over traditional delivery methods, one cannot simply blindly convert all printed study material into web-delivered courses or convert all training and education activities to e-learning events. Often training manuals may serve learners better when they remain in their printed form. The conversion from printed

format to an online format only adds value when the material is redesigned to take advantage of the new media. E-learning in particular offers the opportunity for static documents to become interactive and instructionally sound tutorials. However, whatever value they may have is derived from the skill with which they are redesigned – and not merely from the web technology (Kruse, 2000b:[Online]).

It is not surprising that learner success in an online learning environment is greatly influenced by the learner's learning style. It has been indicated that learners with, for instance, a visual learning style or a learner with an independent behavioural style learn better in the web environment. On the other hand, learners who are more aural, dependent and passive, are less successful. These differences have led researchers to make the proposition that to achieve optimal learning potential, instructional approaches should accommodate *various learning styles* while being supported by appropriate technologies (Chale & Michaud, 1997:8; Meyer, 2003:[Online]).

I considered each of the research questions and all the issues in the process of developing an effective nutrition and HIV and AIDS distance education course for adult learners from previously disadvantaged communities. I accepted that the course content should be both interactive and stimulating. I also accepted that learners should be challenged to direct their own exploration and knowledge formation, and that I needed to accommodate differences amongst learners with regard to learning styles and varying approaches to studies.

❑   Conclusion

The literature provides substantive evidence that there is an increasing need for distance education as an alternative to more traditional classroom-based instruction and for providing relevant and accessible training to skill or re-skill people. Higher distance education institutions can provide for the needs and demands of society by providing asynchronous or synchronous e-learning opportunities to learners disadvantaged by the constraints of time, distance, physical disability, economics, and social and personal circumstances. A growing number of adult learners are turning to higher distance education institutions to provide them with more accessible and flexible educational programmes that will meet their particular learning needs.

Sufficient literature is available on the design and development of e-learning material. There is a sound body of research in instructional design, usability features and theoretical models that can guide prospective website and course designers to develop good online and e-learning materials. The literature also describes the constraints associated with the implementation and use of e-learning in the education and training of learners.

Although a great deal has been published about the design, development and use of e-learning, most of the authors concerned reported on the role of e-learning in the traditional classroom-based situation. The available literature gave no clear indication as to whether the application of e-learning

in a true distance education institution would be different from or similar to that in traditional classroom-based institutions. Little has been published on what features an e-learning course in an African context should have if learners come from different cultural backgrounds and previously disadvantaged communities, and how one should go about offering courses to postgraduate learners with different academic backgrounds.

Although there are numerous examples of online and/or computer-assisted education in the literature, there is very little reported research into online and/or computer-assisted education in the public nutrition domain in an African context. The available literature does not indicate that any research has been conducted in distance education and public nutrition in Africa with special reference to nutrition and HIV and AIDS. It may therefore be concluded that the distance education needs of adult learners from previously disadvantaged communities in public nutrition, and especially those in the field of nutrition and HIV and AIDS, have not been satisfactorily addressed by an effective utilisation of media and appropriate technologies.

The next chapter will present the a description of the research project and the research methods used to address the research question concerning the offering a distance education course consisting of a combination of media and technologies to facilitate the education of adult learners from previously disadvantaged communities in nutrition and HIV and AIDS.

CHAPTER 3

Research project: The learning website

3.1   Introduction

This chapter describes the design, development, implementation and evaluation of one of the contributory tuitional 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 as 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.
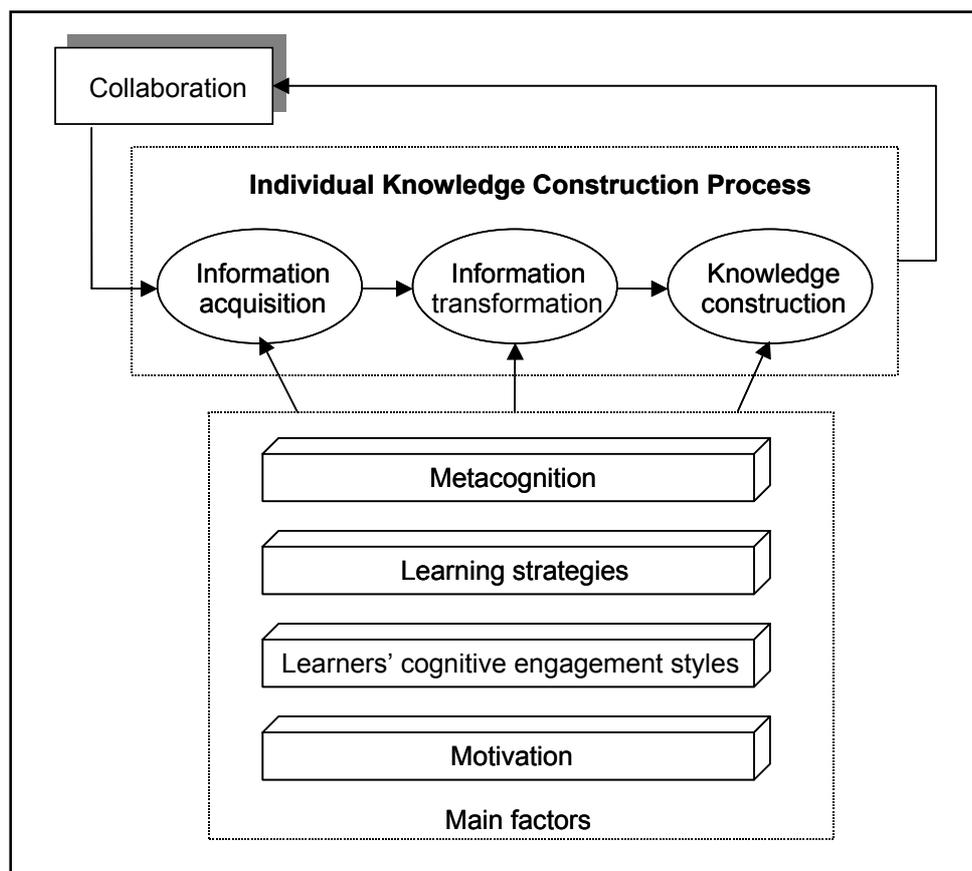
Figure 3.1: Individual knowledge construction model (Kang & Byun, 2001:50)

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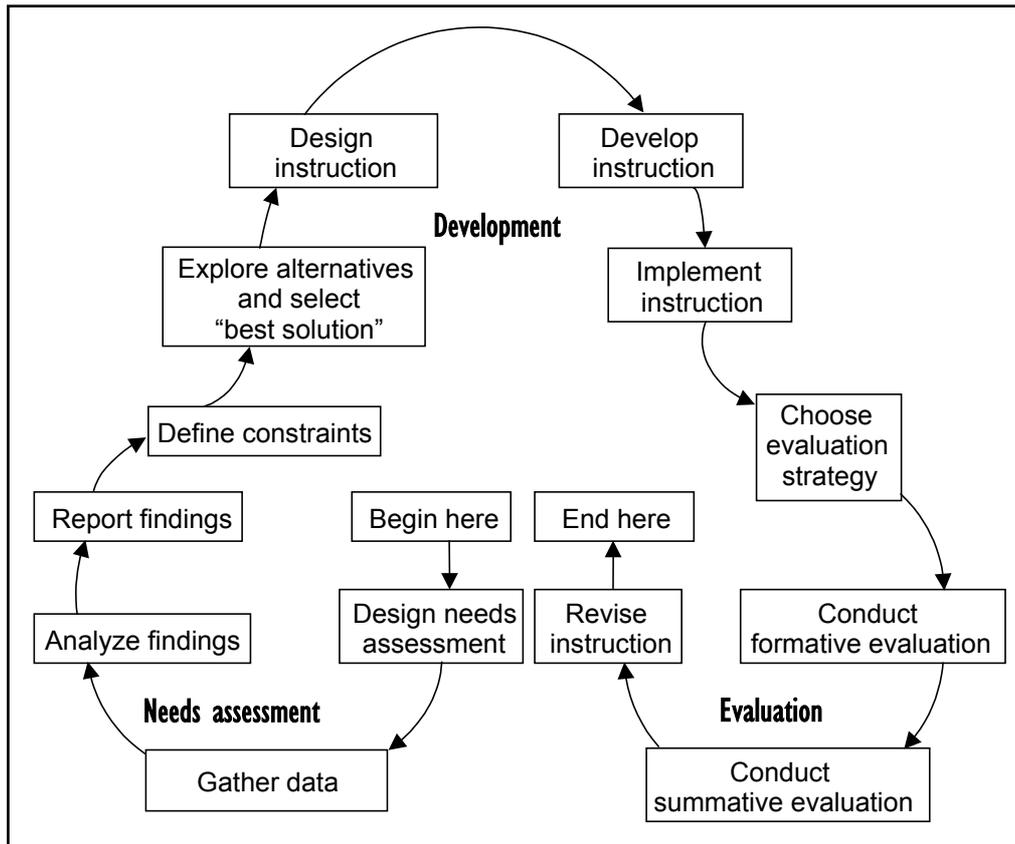
Figure 3.2: Step-by-step formulation of instruction (Eastmond, 1994:90)

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 form 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	
	Mpumalamga	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 fist 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 assess 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 fist 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 Dreamveaver3. 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	• 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: • 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.
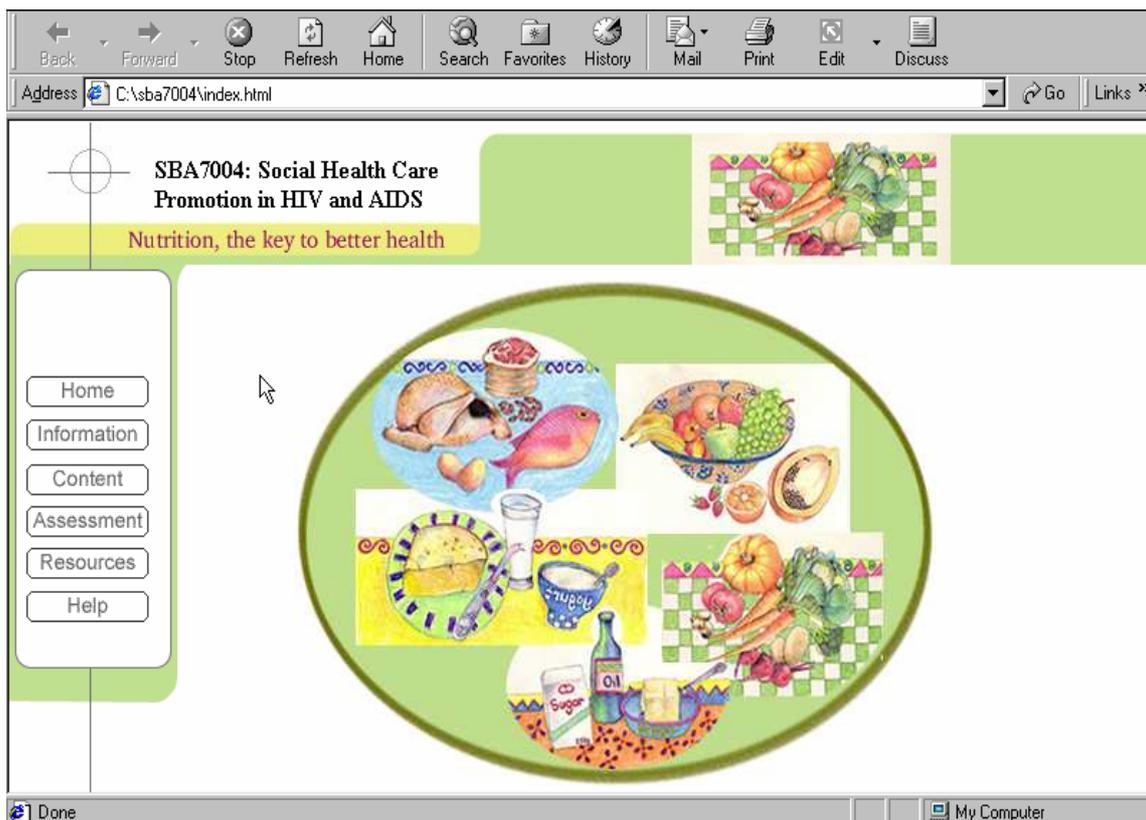
Figure 3.3: The home page of the website

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.
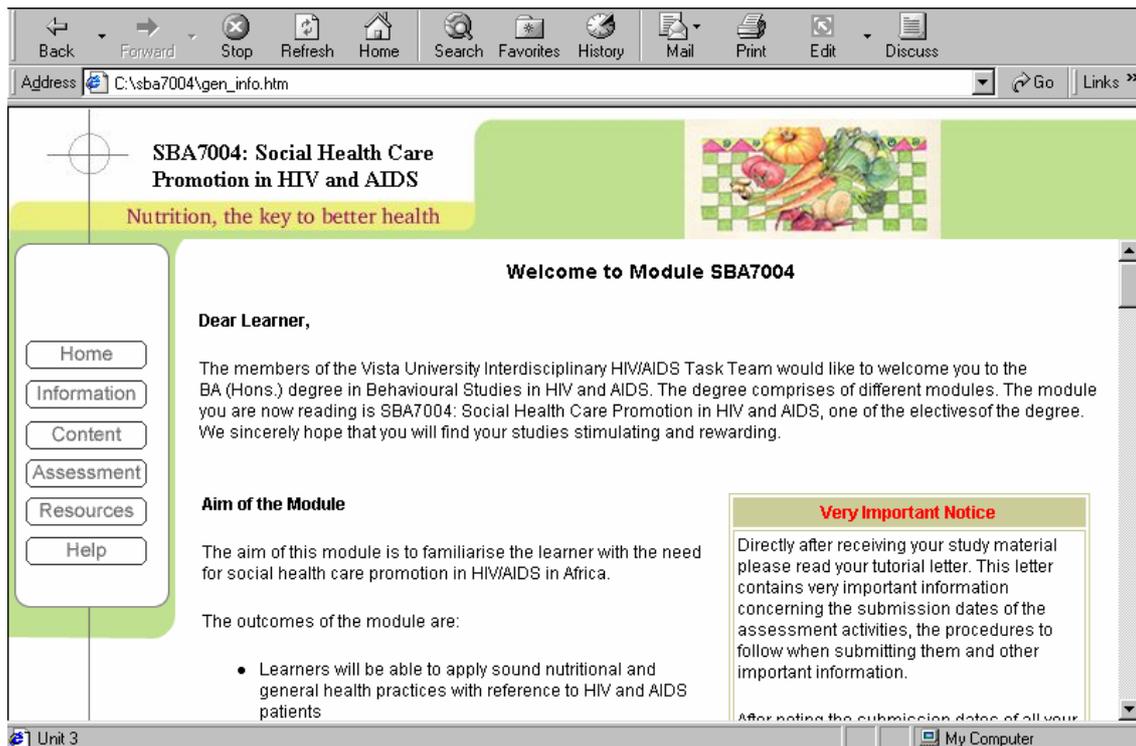
Figure 3.4: The information page

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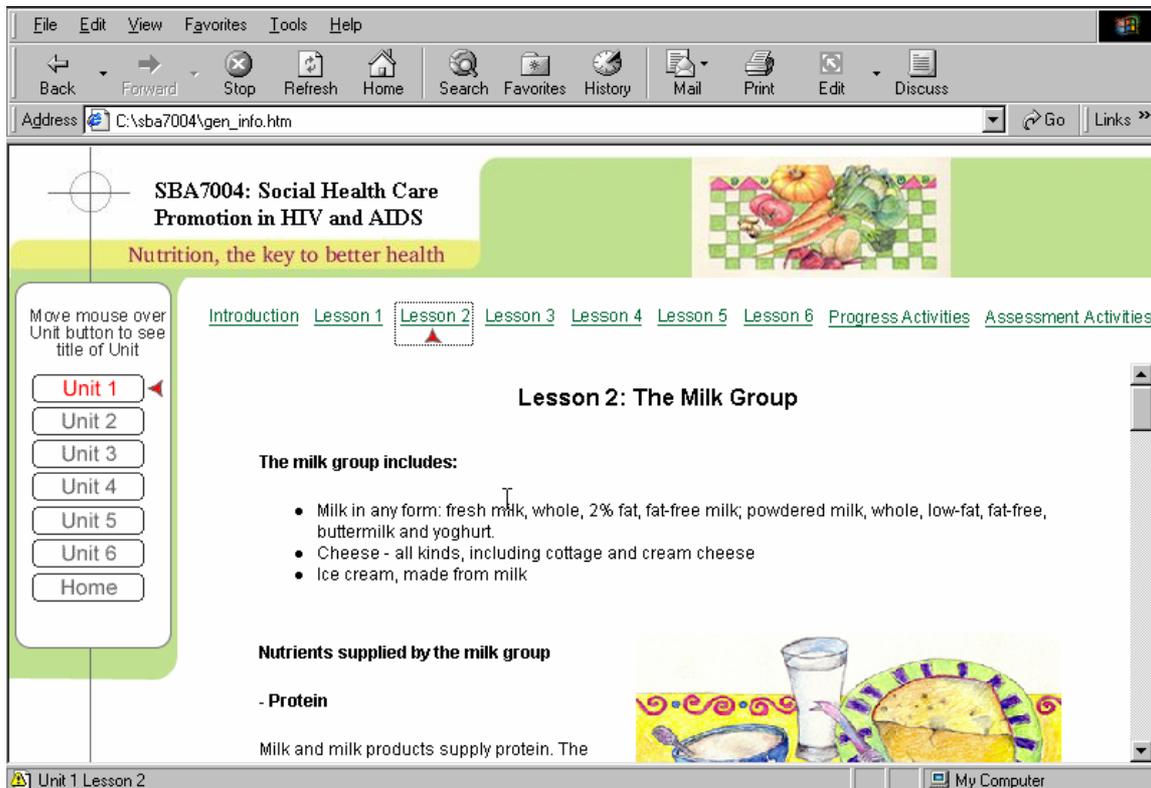
Figure 3.5: Visual indicators of where learners are in the website

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.
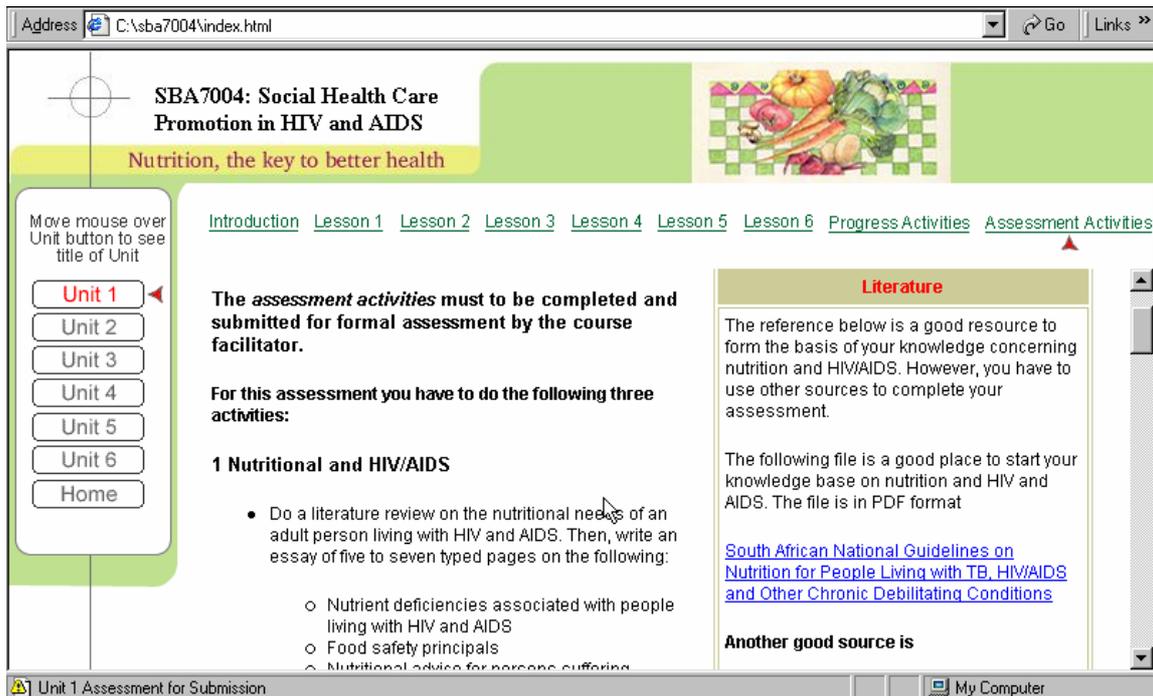
Figure 3.6: An assignment page

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.
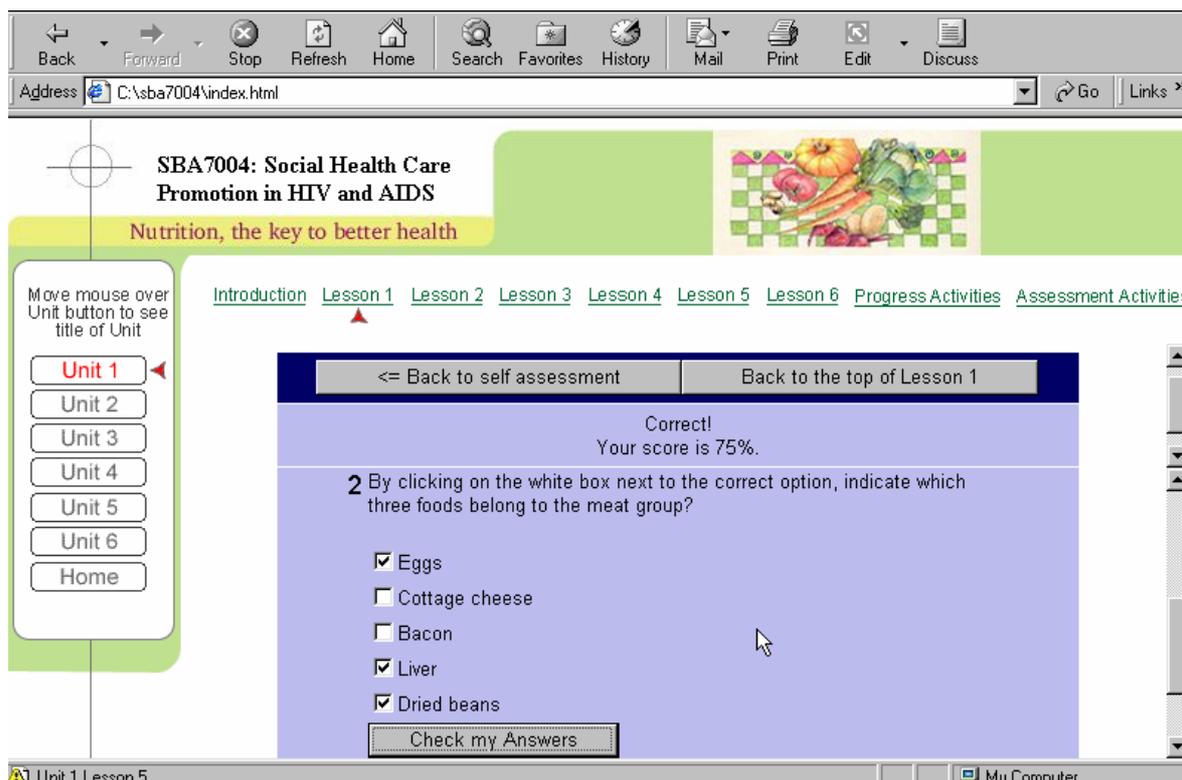
Figure 3.7: Multiple-choice questions

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 VUDEC 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 imple-menting 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 form 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.

Chapter 3   131

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 essences 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. The 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. The 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 difficulty 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 designed the website in such a manner that the users should not have to click more than three or four time 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?", "Lets 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.

CHAPTER 4

Research Results

4.1   Introduction

This chapter describes the findings that emerged from the research and attempts to answer the following research question:

What factors and constraints need to be considered when using a course comprising a combination of media and technology for the teaching and training of nutrition and HIV and AIDS in a South African distance education university?

Data concerning the use of a combination of media and technology for a distance education course was collected by means of thee questionnaires. The questionnaires used were titled:

- Questionnaire A – Learner profile
- Questionnaire B – Formative evaluation of the website
- Questionnaire C – Summative evaluation of a combination of media and technology as mode of instruction

The questionnaires were distributed to all the learners who had attended the contact sessions during the academic year. The contact sessions were compulsory and only for exceptional reasons were learners exempted from attending the contact sessions. One learner from Cape Town did not attend contact sessions but completed the evaluation through e-mail. Ninety-five per cent of the learners returned their completed questionnaires. The findings are reported as they occurred per instrument. The results from the three questionnaires are reported below.

4.2   Questionnaire A: Learner profile

Results relevant to the study are summarised in the following tables. Personal and demographic details about learners are shown in chapter 3 (Table 3.3).

Table 4.1 on the next page summarizes learners' final school qualifications as an indication of the educational level of the learners enrolled for the degree.

Table 4.1: Educational background of learners

		2002 (n=43)	2003 (n=64)	
Educational background		**Percentage**		**Significance**
Highest school qualification	Matriculation certificate with **university** exemption	60,0	61,9	The majority of learners have obtained a matriculation certificate with university exemption. However, on average, 32 per cent of the learners only passed the senior certificate examination without university exemption. These and the other learners were admitted on the grounds of their age.
	Senior certificate (without university exemption)	27,5	36,5	
	Grade 11	0,0	1,6	
	Grade 10	2,5	0,0	
	Other	10,0	0,0	

Table 4.1 listed the educational background of learners. The highest school qualification was listed followed by the percentages in each category and the significance thereof for the study. The next table gives information on the learners' professional background.

The professional background of learners relevant to the study including their current professions, their years of working experience, their most recently completed qualification, and the year in which they completed their most recent qualification. The significance of these facts is summarised in Table 4.2 on the next page.

Table 4.2: Professional background of learners

Professional background		**2002** (n=43)	**2003** (n=64)	Significance
		Percentage		Significance
Current profession	Unemployed	20,5	21,9	More than half of the learners are teachers with some kind of tertiary education. More than 20 per cent of learners in both years are unemployed and have little or no working experience. The diversity reflected in these factors should be taken into consideration by the planners of educational material.
	Nursing	2,5	9,4	
	Teaching	56,4	50,0	
	NGO	0,0	3,1	
	Self-employed	7,7	0,0	
	Government	7,7	1,6	
	Other	5,2	4,7	
Years of working experience	No experience	6,3	17,0	Most of the learners have working experience in the field of education. There are, however, learners with no working experience at all. This variation in amount of work experience needs to be considered when the designer refers to work-related issues.
	1 - 5	9,4	7,6	
	6 - 10	25,0	22,6	
	11 - 15	31,3	13,2	
	16 - 20	21,7	22,6	
	21 and more	6,3	17,0	
Most recently completed qualification	Teaching diploma	31,6	8,1	The average (over two years) shows that 58,6 per cent of the learners has a bachelor's degree. It was found that learners with other qualifications, although on the same level in terms of NQF classifications, experienced difficulties in coping with the outcomes of this degree.
	Nursing diploma	0,0	1,6	
	Bachelor's degree	52,6	64,5	
	Honours degree	10,5	9,7	
	Other	5,3	16,1	
Year in which the most recent qualification was completed	2000 and after	15,8	57,4	Although most of the learners had completed their previous qualification recently, there were others who had not studied in the previous ten years. These learners are often uncertain about their studies and they need more support and guidance about what is expected from them in distance education study.
	1996 - 1999	31,6	27,9	
	1991 - 1995	28,3	9,8	
	1990 and later	23,7	4,9	

Table 4.2 listed the various categories of the professional backgrounds of learners. The percentage of the various categories was listed followed by the significance thereof for the study. The majority of

learners were teacher while more than 20 per cent of learners were unemployed and had no working experience. On average nearly 60 per cent of learners had a bachelor's degree while the remaining learners had other qualification on the same NQF level. Most learners had completed their previous qualification recently, however, there were others who had not studied in the previous ten years. When designing educational material on post graduate level where the majority of learners are older adult one should take into consideration factors such as professional background and how many years ago they have completed their previous qualification. These factors can have an influence on how easily learners can adjust to having to study again. The next table gives information on the learners' study methods.

Table 4.3 on the next page summarises whatever learners' study methods are relevant to the study, including learners' views on how suitable for study their home situations are, the location where they usually study, the average number of hours they spend each week on study, their opinions about their own levels of competency for study through the medium of English, their preferences with regard to assessment, and the significance of these factors.

Table 4.3: Study methods and circumstances

Study methods and circumstances		2002 (n=43)	2003 (n=64)	Significance
		Percentage		
Suitability of the home situation as a venue for study	Fairly difficult	20,5	10,9	The majority of learners assessed the suitability of their home situations for purposes of study between convenient and excellent. This should contribute to the successful completion of their studies.
	Convenient	30,8	43,8	
	Good	35,9	32,8	
	Excellent	12,8	12,5	
Location of study	At the dining room/kitchen table	12,8	28,1	38,5 per cent of the 2002 learners studied at the library. The number decreased in the 2003. However, the number of learners studying at the library is an indication that the University should provide the learners with access to Internet and computer facilities for their studies. The results indicate that the learners not studying at the library have limited space available to them for the pursuit of their studies and the accommodation of additional education material and equipment.
	In my bedroom	15,4	32,8	
	At work	10,3	7,8	
	At a friend's or relative's home	0,0	3,1	
	In a study at home	23,1	9,4	
	A library (other than my work place, e.g. public library, University library)	38,5	18,8	
Average number of hours spent on studies per week	5 Hours or less	38,9	50,9	The data shows that learners have limited time to spend on their studies since most of them are females who work full-time and who have to attend to the responsibilities of a home and family.
	Between 6 and 10 hours	19,5	22,4	
	Between 11 and 15 hours	11,1	12,7	
	Between 16 and 20 hours	8,3	9,1	
	More than 20 hours	22,2	10,9	
Learners' opinion about their level of competency for studying in English	Excellent	23,1	27,4	Although, on average, 50 per cent of the learners view their English competency as "good", only an average of 3,3 per cent (on average) have English as their mother tongue. Since all the study material is offered in English, the level of English should accommodate the learners' language competency.
	Good	48,7	46,8	
	Satisfactory	28,2	24,2	
	Poor	0,0	1,6	
Learner assessment preference	Complete assignments during the course and a competency assignment at the end of the course	76,3	82,3	There is a clear preference among learners for a more outcomes based approach to assessment. Learners prefer not to write tests and examinations. Assessment in the programme is outcomes based and does not use tests and examinations as a method of assessment.
	Writing tests during, and an examination at the end of the course	23,7	17,7	
Study practices	Learner memorises study materials	0,0	0,0	The majority of learners try to understand and then apply the content. None have indicated that they *only* memorise the content. The course content should be written systematically, clearly with enough detail to make the content comprehendible to all the learners.
	Learner tries to understand and then apply the study material	76,3	61,9	
	Learner both memorises and then applies the study material	23,7	38,1	

Table 4.3 listed the various study methods and circumstances of learners. The percentage of the various categories was listed followed by the significance thereof for the study. Most of the learners felt that their homes situation was suited for study purposes. However, nearly 60 per cent of learners indicated that they study at the University library which is and indication that the University should provide the learners with access to Internet and computer facilities for their studies. Learners have limited time to spend on their studies because of their work and home responsibilities. This factor should be considered when planning the assessment activities. As learners indicated that they prefer a more outcomes based approach of assessment. Applying this approach provides more flexibility for completion of an assessment than going through the stressful preparation and writing of an examination. Although, more than 50 per cent of the learners view their English competency as "good", the majority of learners indicated that they try to understand the work and then apply it. The course content should therefore be written systematically and clearly to accommodate adult learners. The next table gives information on the learners' computer and technology access.

Table 4.4 on the next page summarizes the availability of whatever computer and Internet facilities are relevant to learners' study. Factors include access to computers for studies, their level of computer literacy and access to the Internet.

Table 4.4: Computer and technology access

Computer and technology access		2002 (n=43)	2003 (n=64)	Significance
		Percentage		**Significance**
Access to computers for studies	Yes	51,3	28,6	Although only an average of 40 per cent of learners have access to computers, accessibility will in future be less of a problem. Twenty computers have been donated to the VUDEC library, and the learner support centres situated around the country are equipped with computers. Learners are not aware of these facilities and need to be made aware of their existence.
	No	48,7	71,4	
Computer literacy	I view myself as computer literate	46,2	14,5	Even if one takes into account the fact that, in 2003,16,5 per cent more learners were computer illiterate than in 2002, the majority of learners are still able to use computers. Since one of the programme outcomes is for the learners to become more computer literate, a website provides them with the opportunity to achieve this outcome. Without computer skills it is difficult to compete in the job-market.
	I have enough computer skills to help myself	20,5	22,6	
	I feel that my computer skills are not adequate	25,6	38,7	
	I cannot use a computer	7,7	24,2	
Access to the Internet	No	46,1	60,3	Although Internet access is still a problem for many learners, increasingly learners are making use of Internet cafés or the facilities of their friends. VISTA University does also provide Internet access to post graduate learners.
	Yes, at work	15,4	12,7	
	Yes, at home	18,0	1,6	
	Internet café	2,6	12,7	
	Friend's home	2,6	6,4	
	Vista University	15,1	6,4	

Table 4.4 listed the various categories of learners' access to computers and technology. The percentage of the various categories was listed followed by the significance thereof for the study.

Although only an average of 40 per cent of learners have access to computers, learners will have access to more computers on campus and at the learner support centres at the new institution (see chapter 1). These venues will also provide Internet assess. The new institution is planning on increasing the number of computers available to learners. This will increase the number of learners who have access to computers and the Internet.

The difference in percentage access to computers between the two year groups could be because of the larger group of younger learners (see chapter 3). Some of these learners as well as some of the older learners, are not employed and cannot afford computers and had no need for computers previously. Most of the undergraduate courses at VISTA, and it seem at a number of other institutions, do not require undergraduate learners to use computers. Many of the learners have not studied with VISTA previously and were not aware of the computer and Internet facilities available.

More than 60 per cent of learners view themselves as computer illiterate. The difference in computer literacy between the two year groups can be explained by the same reasons as given for access to computers. Giving learners the opportunity to use the Internet and the learning website for their studies gives learners an opportunity to gain and/or improve their computer skills. Without computer skills it is difficult to compete in the job-market. Media such as radio, television, audiotape and video recordings were not considered as media options for this programme since Vista University do not have the facilities nor the capacity to produce any of these media.

The data indicates that learners who enrolled for the Social Behavioural Studies and HIV and AIDS programme are older, working people, with women in the majority. Because learners are from diverse backgrounds and cultures, English is the language best suited for presentation of course content since most of the learners view their competency in English for study purposes as ranging between good and excellent. On average, 40 per cent of learners have access to computers and 47 per cent have Internet access (See Table 4.4). However, only 11 per cent of learners use the computer and Internet facilities available at the University library. The University provides computer and Internet facilities to postgraduate learners free of charge.

4.3   Questionnaire B: Formative evaluation of the website

In this section, the results from the quantitative analysis of the formative evaluation of the website (Questionnaire B) are reported and discussed. Since there was no significant difference between the variables of the formative evaluation of the two year groups, the data was combined and the results are reported as such.

The first part of the questionnaire covers the design features of the website while the latter focuses on how the learners viewed the course. The questionnaire comprises a number of questions, each followed by a number of statements related the question. The learners had to respond by rating the statements on a 5-point Likert scale. The Likert scale ranges from:

    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)

The results gathered from Questionnaire B are reported as a question followed by graphic representations which reflect how learners rated the statements, interpreted in terms of frequency percentages. A brief discussion follows each question.

As stated in chapter 3, an introduction on how to use the Internet was given to the learners during the contact sessions. The majority of learners had no difficulty in using the Internet. Only a small number of learners needed some time to find their way around on the Internet. After mastering the Internet the learners had no difficulty accessing the nutrition and HIV and AIDS website.

4.3.1   How did you (the learner) experience the screen display of the website?

The acceptability of the screen display to the learners is considered by me to be important since the screen display forms an important part of the website's interface. Since the majority of learners have no (or limited) e-learning experience, they had no (or very little) frame of reference that they could use to compare the screen display they encountered with that of a similar website. However I am of the view that notwithstanding their lack of exposure to other websites, the learners have the ability to evaluate the following screen display features, which are broadly grouped under the following headings:

Visual impression
- Visual presentation
- Fullness and overcrowding of screen
- Screen distraction

Organisation of screens and information
- Sequencing of screens
- Screen layout
- Organisation of information

General screen features
- Clarity of buttons, symbols and graphics
- Positioning of information
- Screen layout of assessments

Figure 4.1, Figure 4.2 and Figure 4.3 comprise statements and graphic representations of how the learners evaluated the screen display of the website in terms of the features listed above.
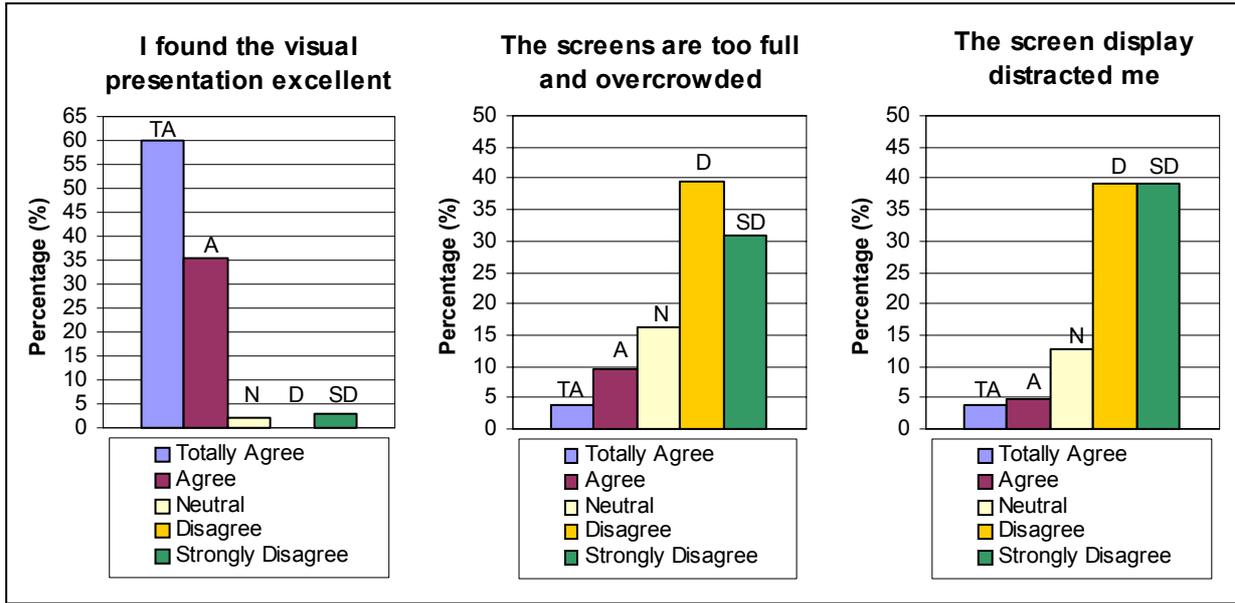
Figure 4.1: Screen display: Visual impression
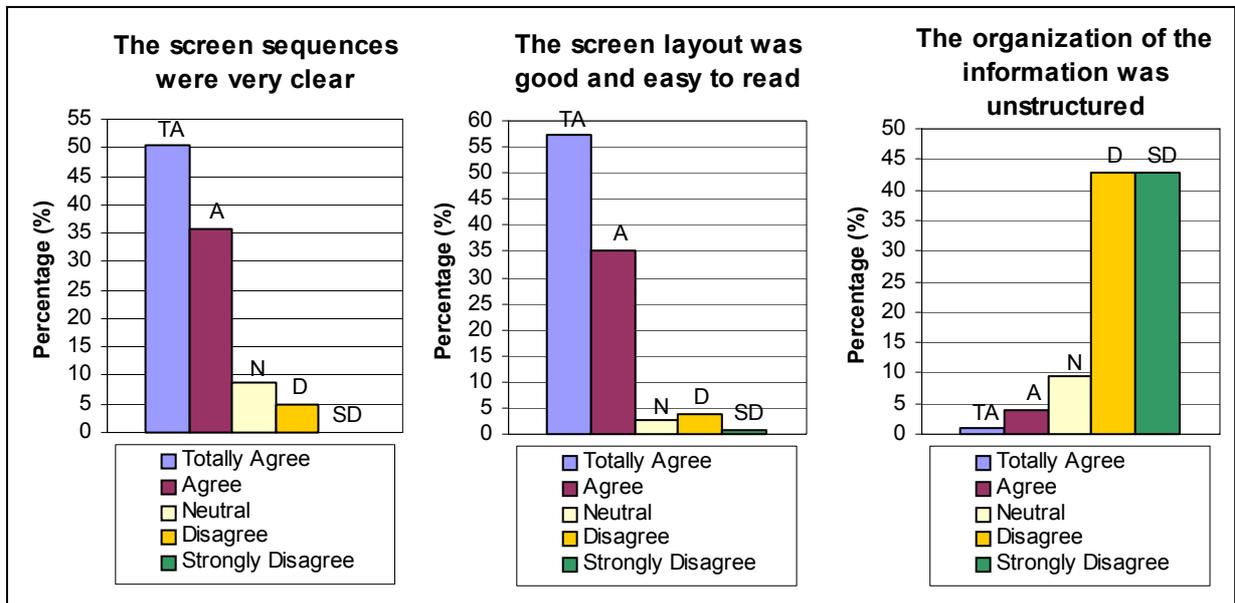
Figure 4.2: Screen display: Organisation of screens and information
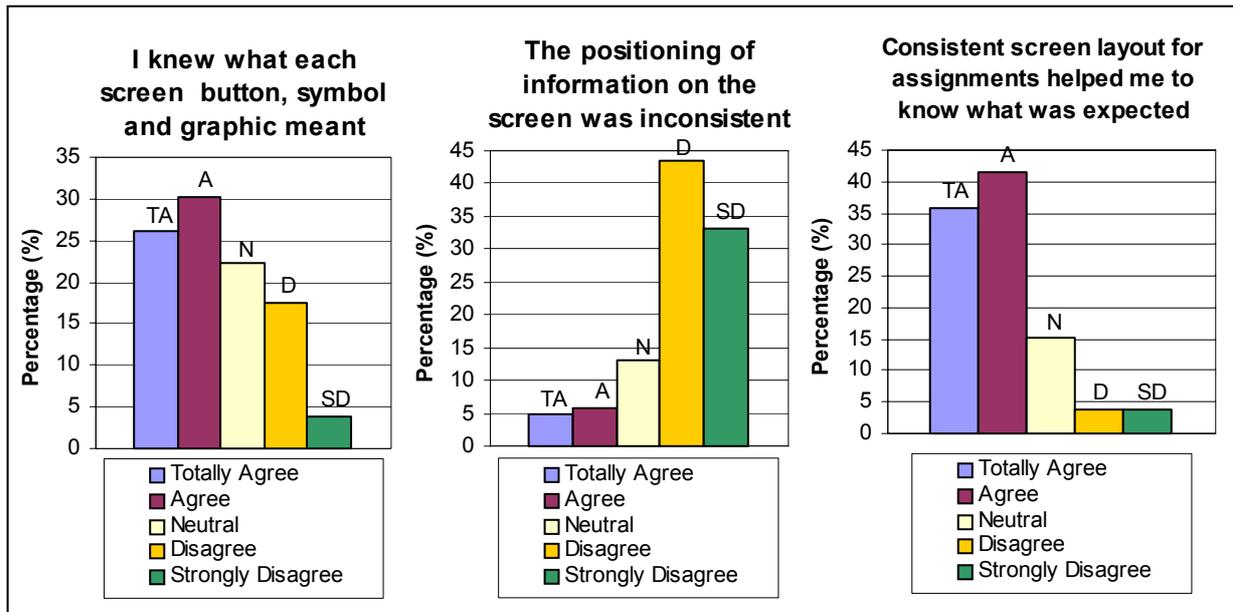
Figure 4.3: Screen display: General screen features

As illustrated in Figure 4.1, Figure 4.2 and Figure 4.3 above, the learners responded encouragingly to the screen display. Most learners rated the visual impression positively. The majority of learners (60,00 per cent totally agreed and 35,24 per cent agreed) rated the visual presentation as excellent (See Figure 4.1). Very few learners were neutral towards the screen display, and less than three per cent disagreed with the statement that the screen display was excellent. Most of the learners did not view the screens as too full and overcrowded (39,42 per cent disagreed and 30, 77 per cent strongly disagreed). Only a small number of learners (4,90 per cent agreed and 3,92 per cent totally agreed) rated the screen display as distracting, while 12,75 per cent were undecided.

The majority of learners rated the organisation of the screens and information positively (see Figure 4.2). Approximately 86 per cent of the learners rated the screens as clear (50,50 per cent totally agreed and 35,64 per cent agreed) and 92 per cent rated the screen layout as good and easy to read (57,14 per cent totally agreed and 35,24 per cent agreed). Most of the learners disagreed with the statement that the organisation of the information was unstructured (42,86 per cent disagreed and 42,86 per cent strongly disagreed).

The general screen features were mostly positively rated (see Figure 4.3). The learners rated the statement *I knew what each button, symbol and graphic on the screen meant* less positively than the other statements. Only 26,21 per cent totally agreed and 30,10 per cent agreed with the statement. A large percentage (22,33 per cent) rated the statement as neutral, and 21,00 per cent of the learners disagreed with the statement (17,48 per cent disagreed and 3,88 per cent strongly disagreed). These findings can be ascribed to the fact that more than half of the learners (53,2 per cent: see Table 4.4) do not have Internet access and are therefore unfamiliar with the meaning of terms such as *buttons* as well as the purpose of buttons, symbols and graphics utilised by Internet

Explorer and other Internet functionalities. Although the buttons, as displayed on the Internet Explorer browser screen, was explained to the learners during the contact sessions, the large volume of new information and the unfamiliarity of working with a computer and the Internet could have influenced the learners' ability to interpret and operate the system. The responses of the large percentage of learners who gave a neutral rating to the statement could be explained by the fact that the learners did not know the meaning of the terms used, especially in the context of the Internet and the website, and therefore were unable to evaluate the statement.

Most of the learners disagreed with the statement that the positioning of the information on the screen was inconsistent (42,86 per cent disagreed and 42,86 per cent strongly disagreed). The fact that 13,21 per cent of the learners rated the statement as neutral may be explained by the possibility that such learners are unfamiliar with what is implied by the statement *positioning of the information*, and the relevance it has to web-page design and other Internet functionalities. A high number of learners agreed (35,85 per cent totally agreed and 41,51 per cent agreed) that the screen layout of the assignments were the same and helped them to understand what was expected from them when they completed the assignments.

Since most of the learners rated the screen display positively, this display will be maintained during further development of the website. The principles applied in the screen design can serve as a template for the design and development of other inline courses for this degree. The next section will analyse text layout of the website.

4.3.2   How did you (the learner) experience the text layout of the website?

Text layout is an unobtrusive but important element in determining the readability and acceptability of the website. The following features were evaluated:

- Readability of text
- Appearance of the font
- Font size
- Colour coding of text
- Text density

Figure 4.4 and Figure 4.5 in the next page comprise statements and graphical representations of how the learners evaluated the text layout of the website according to the features listed above.
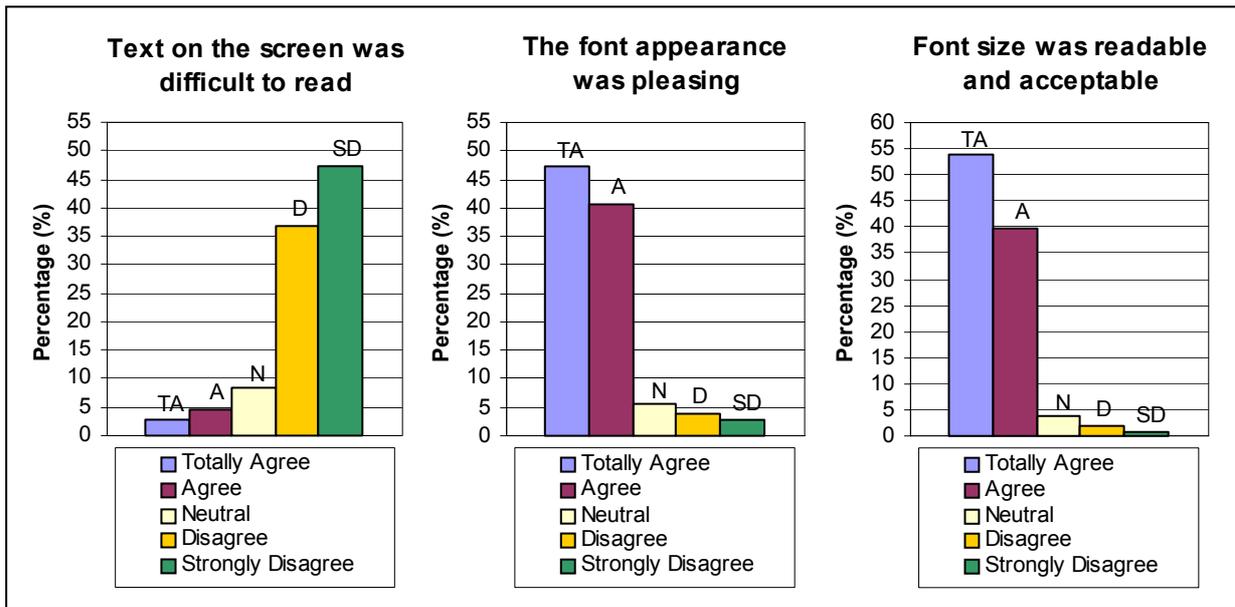
Figure 4.4: Text layout of website
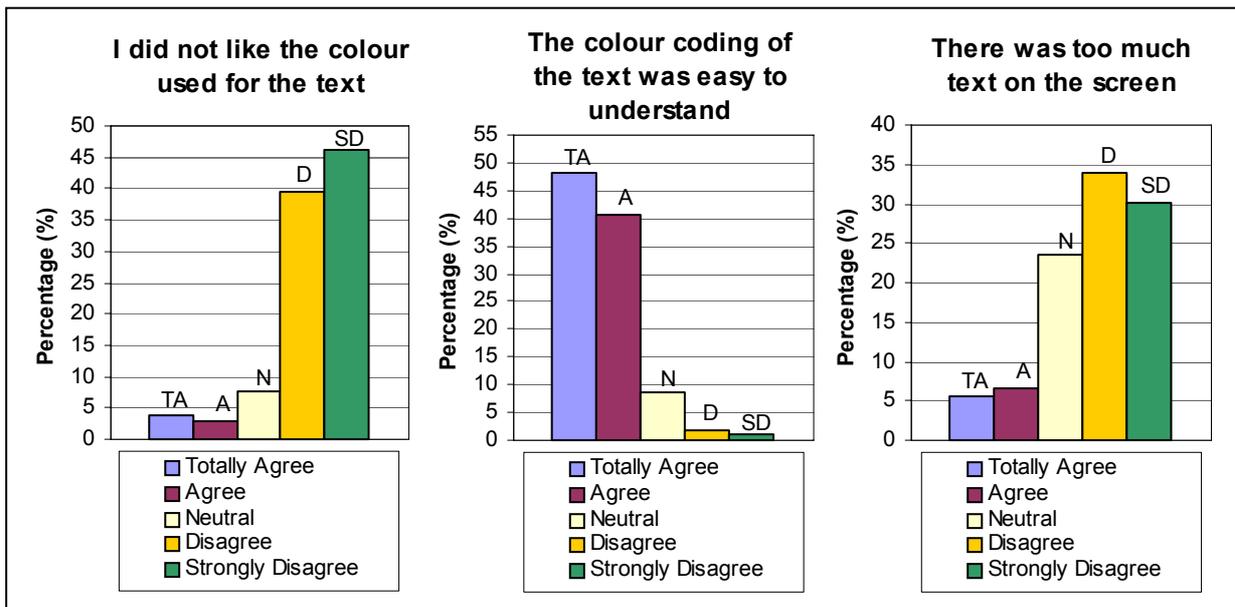
Figure 4.5: Text layout of website (continued)

Most of the learners reacted positively towards the text layout. Nearly 84 per cent of learners disagreed (36,79 per cent disagreed and 47,17 per cent strongly disagreed) with the statement that the text was difficult to read. It is noted that 7,55 per cent (2,83 per cent totally agreed and 4,72 per cent agreed) agreed with the statement, and 8,49 per cent of learners rated the statement neutral. This is not necessarily due to the fact that the text is difficult to read since the text font is *Arial*, which is highly readable. I subsequently found how many learners do not realise the extent to which their

eyesight has deteriorated and why they therefore have difficulty in reading. This is especially true for older learners. Nearly 16 per cent of learners in this group are 35 years old or older.

Most of the learners agreed with the following first three statements and disagreed with the last statement:

- The font appearance was pleasing on the eye (87,74 per cent agreed)
- The font size was readable and acceptable (93,39 per cent agreed)
- The colour coding of the text was easy to understand (88,68 per cent agreed)
- I did not like the colour used for the text (84,85 per cent disagreed)

Although 64,15 per cent of the learners disagreed with the statement that there was too much text on the screens (33,96 disagree; 30,19 strongly disagree), there was a high (23,58 per cent) choice of the neutral rating. This could probably be explained by the fact that many learners had little or limited exposure to the Internet (See Table 4.4) and had no frame of reference for what is really meant by *too much text on the screens*.

It is encouraging to see how positively learners rated the text layout features. These features can be maintained for the further development of the current website and serve as guidelines for the development of similar websites. The following section will analyse the language and terminology of the website.

4.3.3   How did you (the learner) experience the language and terminology of the website?

The use of language and terminology that is clear and understandable to the learners is very important since English (as indicated by the learner profile; see Table 3.3) is not the mother tongue of the majority of learners. The following features were evaluated in order to establish how acceptable the language and terminology were to the learners:

- Level of the language
- Consistent use of terminology
- Explanation of unfamiliar subject-related terminology
- Prompts for input
- The length of sentences

Figure 4.6 and Figure 4.7 on the next page comprise statements and graphical representations of how the learners evaluated the language and terminology of the website according to the features listed above.
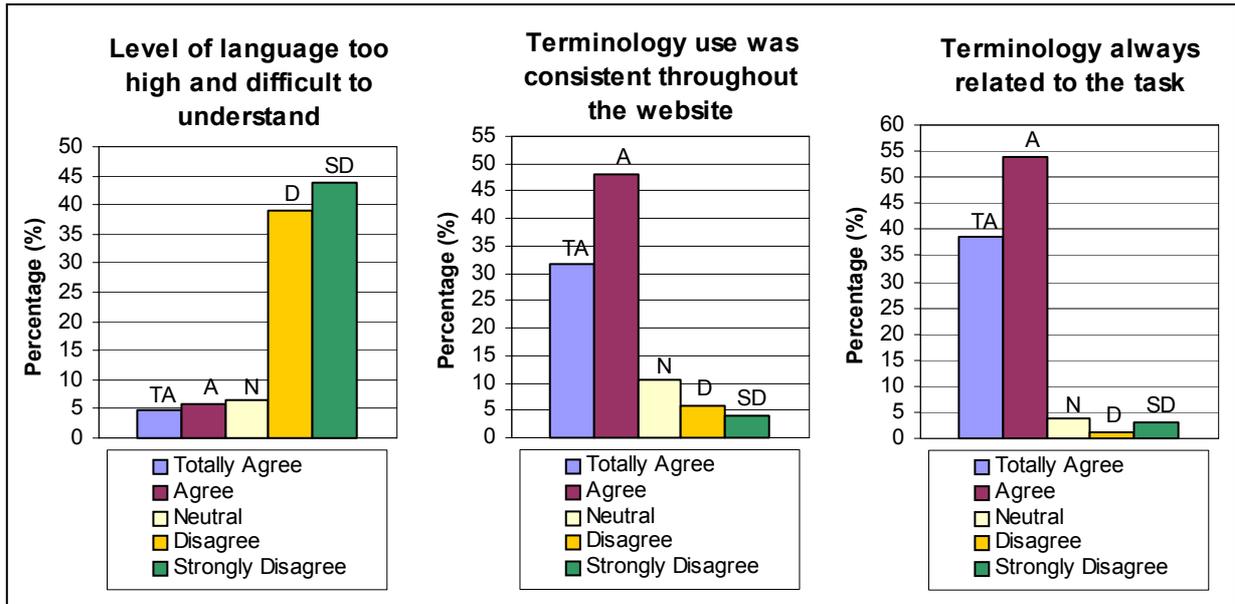
Figure 4.6: The language and terminology used in the website
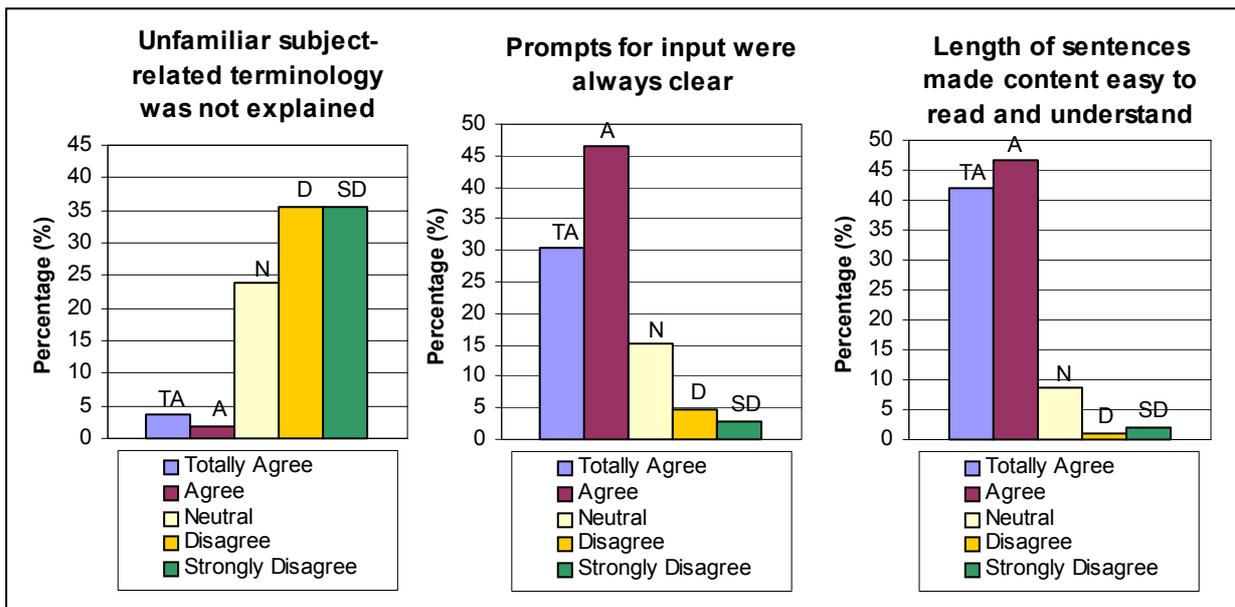
Figure 4.7: The language and terminology used in the website (continued)

Less than 11 per cent of learners agreed (4,76 per cent totally agreed and 5,71 per cent agreed) that the language level was too high and that this made it difficult to understand the content of the course. It is a matter of concern that 11 per cent of this postgraduate group of learners still have a problem with understanding content that is written in simple English. It might the case that these learners have not yet mastered English at this simple level, or that the jargon of the subject matter is unfamiliar to them since the majority of learners come from backgrounds in which they have had no

experience or familiarity with science-related topics. I noted that a number of learners have difficulty in conveying information in writing. It may be the case that these same learners experience difficulties when it comes to interpreting the written language. However, the majority of learners (39,05 per cent disagreed and 43,81 per cent strongly disagreed) did not find the language level too high.

Nearly 80 per cent of learners (31,73 per cent totally agreed and 48,08 per cent agreed) agreed that the terminology used was consistent throughout the course, and 92 per cent agreed that the terminology related to the task (38,46 per cent totally agreed and 53,85 per cent agreed). Seventy-one per cent of learners (35,40 per cent disagreed and 35,40 per cent strongly disagreed) disagreed with the statement that unfamiliar subject related terminology was not explained. Nearly a quarter of the learners (23,89 per cent) rated the statement neutral. This high number could be accounted for if these learners had not worked through the course in depth and were therefore were unaware that there might be unfamiliar subject-related terminologies on the website.

Seventy-seven per cent of learners (30,48 per cent totally agreed and 46,67 per cent agreed) agreed that the prompts for input were always clear. The majority of learners (41,90 per cent totally agreed and 46,67 per cent agreed) found the length of the sentences acceptable – which (for them) made the content easy to read and understand.

4.3.4   How did you experience the graphics and colour of the website?

The choice of colour can play a role in the acceptability of the website. Graphics add to the appeal and effectiveness of the course and break the monotony of the text. The features listed below were evaluated to establish the how acceptable the colour and graphics of the course are:

- Effectiveness of graphics
- Whether the graphics distracted the learners' attention
- Acceptability of graphic colours
- Preference for graphics
- Acceptability of colours used for course

Figure 4.8 on the next page comprises statements and graphical representations of how the learners evaluated the graphics and colour of the website according to the features listed above.
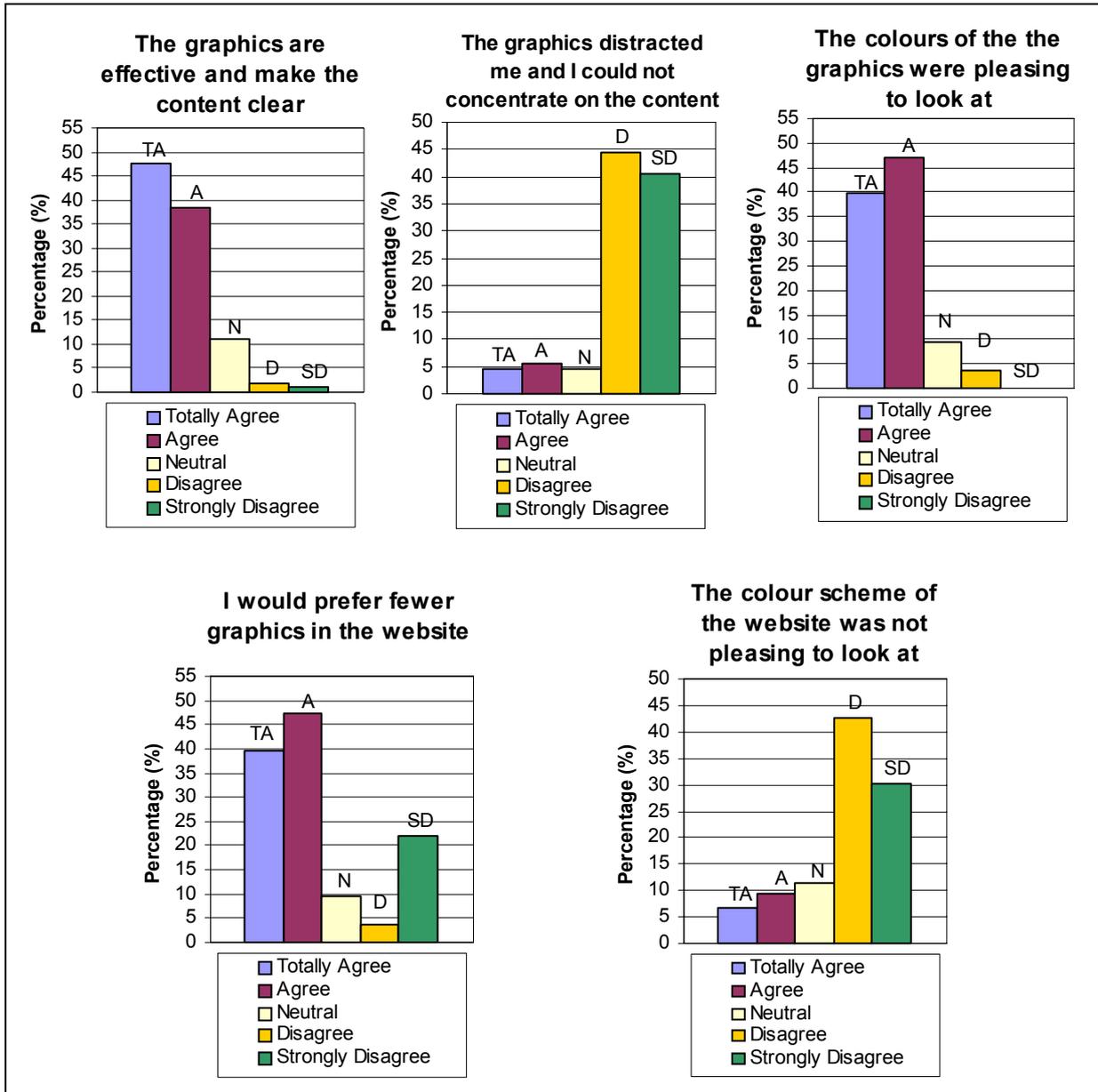
Figure 4.8: The use of graphics and colour in the website

In general the learners agreed (47,66 per cent totally agreed 38,32 per cent agreed) that the graphics are effective and clarify the content. Less than three per cent of learners (1,87 per cent disagreed and 0,93 per cent strongly disagreed) felt that the graphics had no effect. However, 11,21 per cent of the learners rated the statement neutral. These variations could be due to the various manners in which learners learn. For instance, some learners learn visually in a way that would be enhanced by the presence of colour, while others learn more effectively by auditory means.

Nearly 85 per cent of the learners (44,34 per cent disagreed and 40,57 per cent totally disagreed) did not feel that the graphics distracted them, nor did it interfere with their concentration. A number

of learners (4,72 per cent totally agreed and 5,66 per cent agreed) did however felt that the graphics distracted them, while 4,72 per cent of learners rated the statement neutral. Just over 12 per cent of learners also agreed with the statement that they would have preferred fewer graphic in the course. This negative and neutral rating concerning the graphics may also be ascribed (as above) to the idiosyncratic way in which some learners learn. If this is the case, it would be natural for them to find the graphics distracting.

A large number of learners (86,79 per cent) agreed that the colours of the graphics were pleasing to look at. More than 72 per cent of learners (42,45 per cent disagreed and 30,19 per cent strongly disagreed) disagreed that the colours used for the website were not pleasing to look at. Eleven per cent of the learners rated the statement on the colour scheme neutral while 16 per cent (6,60 per cent totally agreed and 9,43 per cent agreed) did not find the colours pleasing. The following comment was made on the colour scheme by one of the participants during an interview:

 "*I do not like the look of the site. I hate green.*" (Rabe, 2003).

Since the majority of learners viewed the colour scheme positively, it will be maintained for future development.

4.3.5   How did you (the learner) experience the content of the website?

The following content features were evaluated:
- The clarity and understandability of the content
- The difficulty level
- Learner satisfaction with the content
- The usefulness of the activities in each unit
- The guidance that the assessment criteria at the end of each unit provided to what was expected from the learners when completing their assessments

Figure 4.9 on the next page comprises statements and graphical representations of how the learners evaluated the content of the course according to the features listed above.
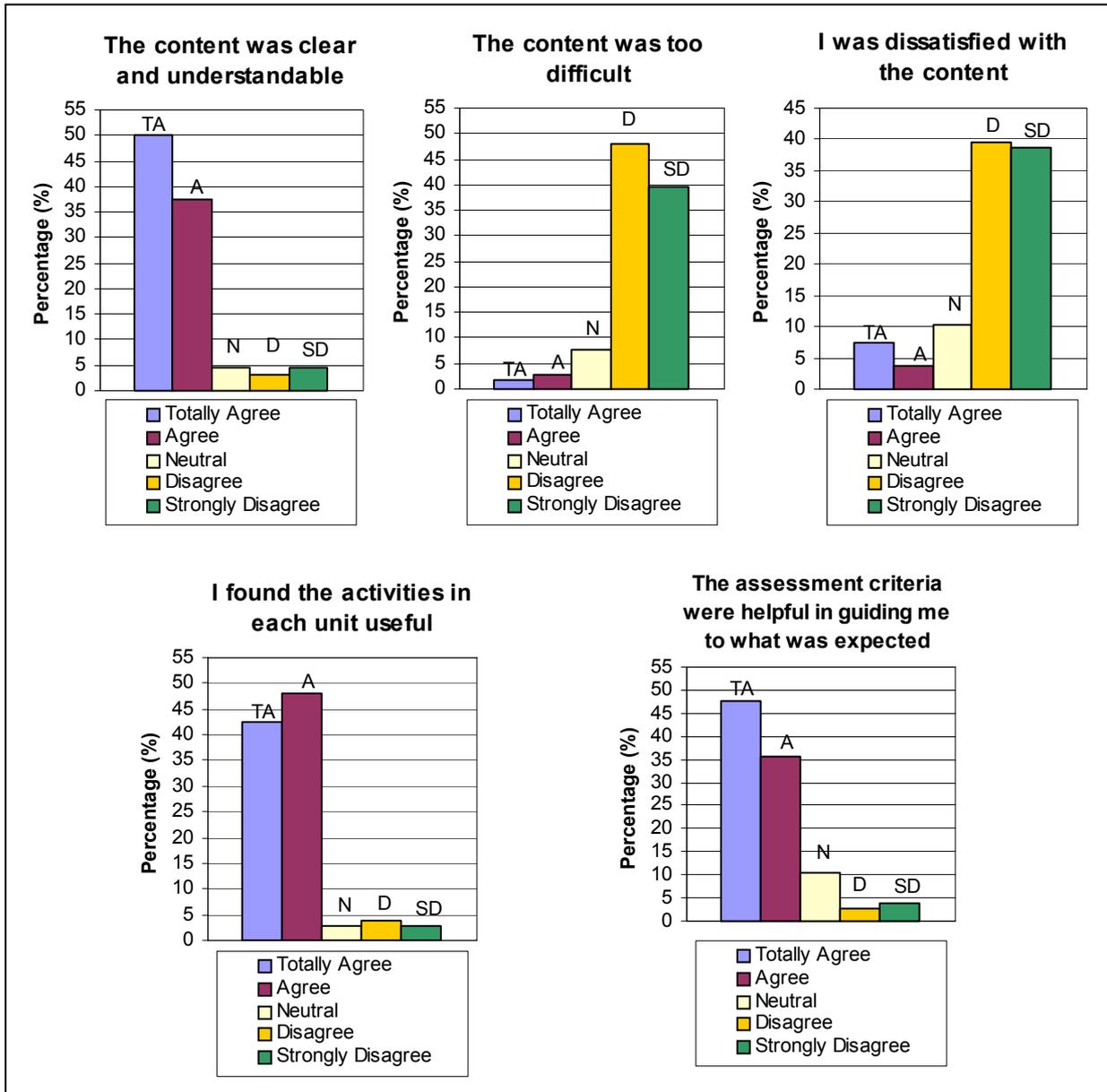
Figure 4.9: Content of the website

The majority of learners (50,00 per cent totally agree and 37,50 per cent agree) found the content of the course clear and understandable. Nearly five per cent of learners were neutral about the clarity and understandability of the content while less than eight per cent (3,13 per cent disagree and 4,69 per cent strongly disagree) viewed the content as unclear and did not understand it. It is to be expected that some learners would find the content unclear and not understandable since the subject content is unfamiliar to most of the learners. These learners need to interact and familiarise themselves with the content.

Most of the learners disagreed with the following two statements:

▪ The content was too difficult (a total of 87,73 per cent disagreed: 48,11 per cent disagreed and 39,62 per cent strongly disagreed).

▪ I was dissatisfied with the content (a total of 78,30 per cent disagreed: 39,62 per cent disagreed and 38,68 per cent strongly disagreed).

The majority of learners agreed with the following statements:

▪ I found the activities in each unit useful (a total of 90,56 per cent agreed: 42,45 per cent totally agreed and 48,11 per cent agreed).

▪ I found the assessment criteria after each unit helpful as a guide to what was expected from me when completing the assessment (a total of 83,17 per cent agreed: 47,66 per cent totally agreed and 35,51 per cent agreed).

4.3.6 How did you (the learner) experience the navigation and interaction within the website?

The ease with which the learners are able to navigate and interact with the content is a very important feature of an online course. The ease of navigation and interaction is one of the factors that will determine if learners will use the website or reject it as too difficult and troublesome to use. The features listed below were evaluated to establish how the learners experienced the navigation and interaction with the course:

- Whether the learners experienced the website as user friendly
- Whether learners felt the course addressed them personally
- Whether the introduction explained the purpose of the module
- Whether there was a clear explanation on how to use the website
- Whether the navigational indicators was clear and consistent
- Whether the learners always knew where they were in the website
- Whether the directions of the website were clear and easy to follow
- Whether it was always clear to the learners as to what they should do
- Whether learners felt they got lost in the content
- Whether learners knew what each button/icon meant and when they had to click on it
- Whether the learners found the option to make a printout of the screen useful

Figure 4.10 and Figure 4.11 on the next page comprise statements and graphical representations of how the learners experienced the navigation of and interaction with the website according to the features listed above.
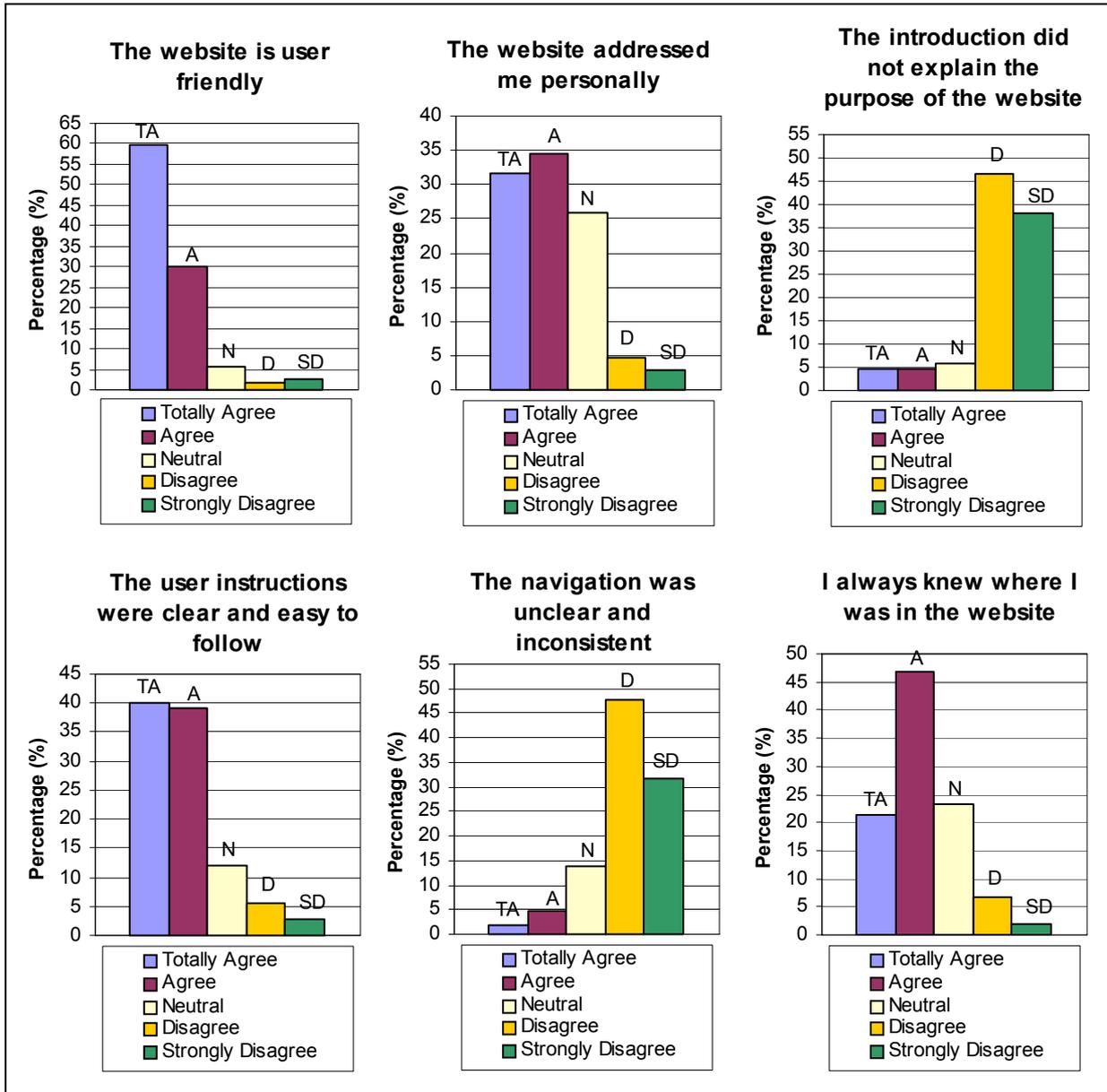
Figure 4. 10: Navigation and interaction of the website
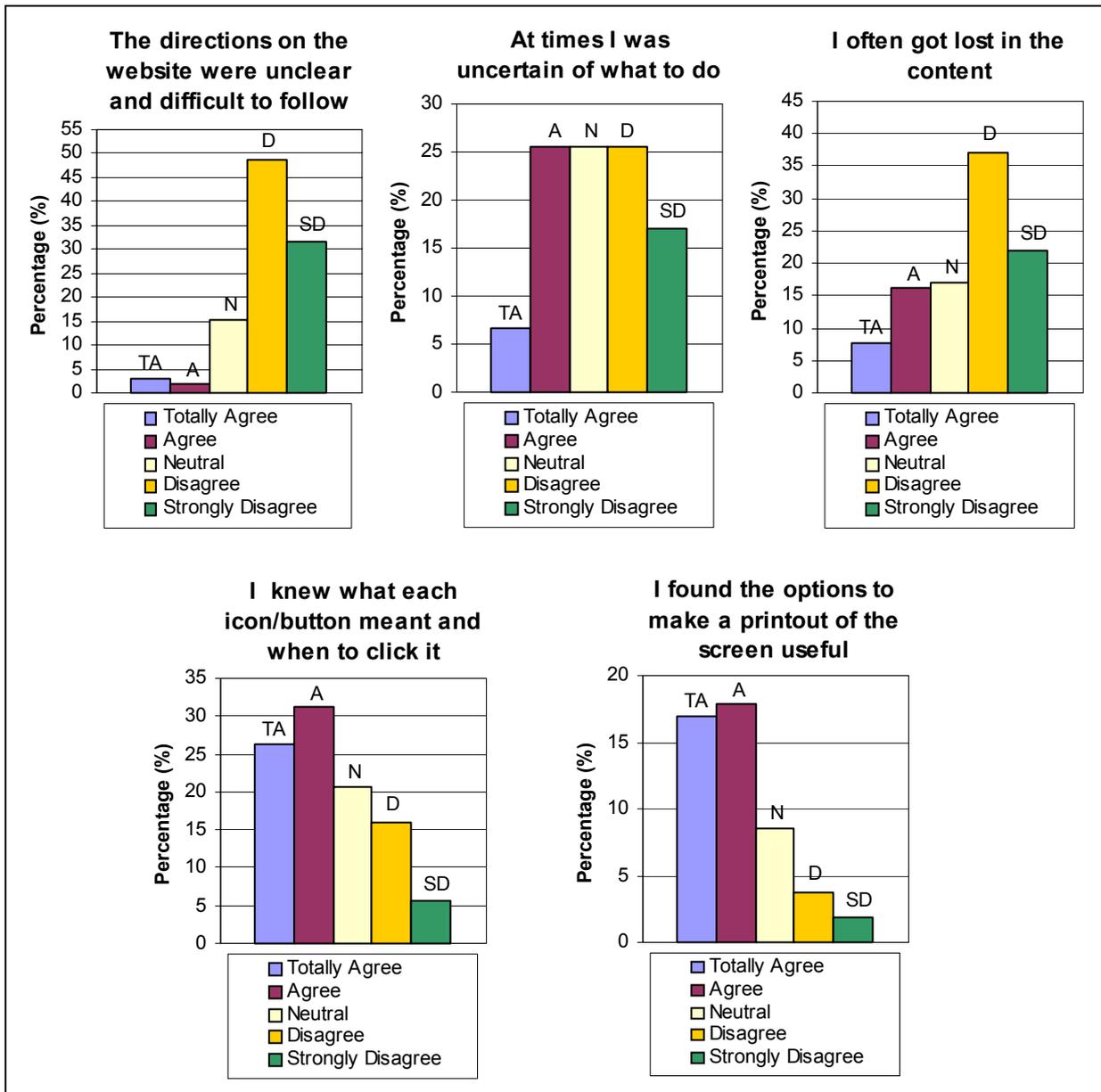
Figure 4.11: Navigation and interaction of the website (continued)

The results indicate that nearly 90 per cent of the learners (59,81 per cent totally agreed and 29,91 per cent agreed) agreed that the website was user friendly. Although 66 per cent of the learners felt (31,73per cent totally agreed and 34,62 per cent agreed) that the course addressed them personally, a large number of learners rated the statement neutral (25,96 per cent). When this website is further developed and revised, it should be written in a more personal manner.

A total of 85 per cent of the learners (46,67 per cent disagreed and 38,10 per cent strongly disagreed) disagreed with the statement that the introduction did not explain the purpose of the website. However, nearly ten per cent of the learners agreed with the statement (4,76 per cent totally agreed and 4,76 per cent agreed). The introduction should be critically evaluated and an attempt should be made to clarify sections that are not clear.

Although 79 per cent of the learners (40,19 per cent totally agreed and 39,25 per cent agreed) felt that the explanation of how to use the website was clear and easy to follow, a small percentage of learners (8,41 per cent) disagreed with the statement, while 12,15 per cent of the learners rated the statement neutral. The negative rating of the statement could be due to the fact that the use of computers and the Internet for study purposes are new concepts for most of the learners. Some learners may not have familiarised themselves with all the concepts of the website. Some may have experienced difficulty in reading a number of instructions and then executing them without another person to assist them in the execution of the process. When this website is further developed and revised, the explanation should be revised and unclear instructions must be clarified.

Less than seven per cent of the learners agreed (1,87 per cent totally agreed and 4,67 per cent agreed) with the statement that the navigation was unclear and inconsistent. Fourteen per cent of the learners rated the statement neutral. These learners most probably do not know what the term *navigation* means. These may be the same learners who have trouble using the website because they do not frequently use computers and the Internet.

A large number of learners (total 68,23 per cent: 21,50 per cent totally agreed and 46,73 per cent agreed) agreed that they always knew where they were in the course. Eight per cent of the learners did not agreed with the statement while 23 per cent of the learners rated the statement neutral. Eighty per cent of the learners disagreed (48,57 per cent disagreed and 31,43 per cent strongly disagreed) with the statement that the directions in the course were unclear and difficult to follow. However, 15,24 per cent rated the statement neutral while nearly five per cent agreed (2,86 per cent totally agreed and 1,90 per cent agreed) with the statement. A larger number of learners (32,07 per cent) were uncertain about what to do at times and 25,47 per cent of the learners rated the statement "At times I was uncertain what to do" neutral. Some learners (23,81 per cent) also felt that they got lost in the content, while 59 per cent of the learners disagreed (37,14 per cent disagreed and 21,90 per cent strongly disagreed) with the statement "I often got lost in the content". Seventeen per cent of the learners rated this statement neutral.

More than half of the learners agreed (26,42 per cent totally agreed and 31,13 per cent agreed) with the statement "I knew what each icon or button meant and when to click on it". Nearly 21 per cent of the learners rated the statement neutral while 21,7 per cent disagreed with the statement (16,04 per cent disagreed and 5,66 per cent strongly disagreed).

The negative and neutral ratings accumulated by the five statements above can be explained by the fact that the learners have had very little exposure to Internet use and are not aware of the features that could assist them with their navigation and operation of the course. During the observation sessions, a number of learners were unsure of their location in the website. When it was pointed out to them that the arrow pointing to the words in the navigation bars are indications of where they are they reacted with amazement. In other instances learners were asked what the problem was when

they seemed stuck. When they were then asked to recall what was said during the introduction on the use of the website, they only then recalled the features such as what indicated their location or methods of using the navigation buttons. In other instances the learners indicted that they did not read the "Help" page before using the course. Often learners need constant reminders about the use of certain features and they need to get used to using a different medium for their studies.

It was noted in the self-assessment exercises that although there are clear instructions on how to complete the exercises, the "Help" feature is not available. During further development, the "Help" feature should be made available at all times.

Only 49 per cent of the learners responded to the statement "I found the options to make a printout of the screen useful". From these, 34,90 per cent agreed (16,98 per cent totally agreed and 17,92 per cent agreed) with the statement, 8,49 per cent rated the statement neutral and 5,66 per cent disagreed with the statement. The low response to this statement could be due to the fact that the pages that are provide in a printable format are available in the study guide. Many of the learners also do not have access to a printer or because they have to pay a fee for having pages printed, they do not make use of such a facility.

4.3.7   How did you (the learner) experience the learning of the website?

The ease with which learners learn to use the website plays a role in determining whether learners will use the website or not. If learners find it difficult to learn how to use the website and do not master the skill, they will not use it. The features listed below were evaluated to establish how learners experienced the learning of the website:

- Whether they found it difficult to learn how to operate the website
- Whether they found it easy to explore the features by trial and error
- Whether it was easy for them to remember names and the use of commands
- Whether they found it difficult to perform tasks

Figure 4.12 on the next page comprises statements and graphical representations of how the learners experienced the learning of the website according to the features listed above.
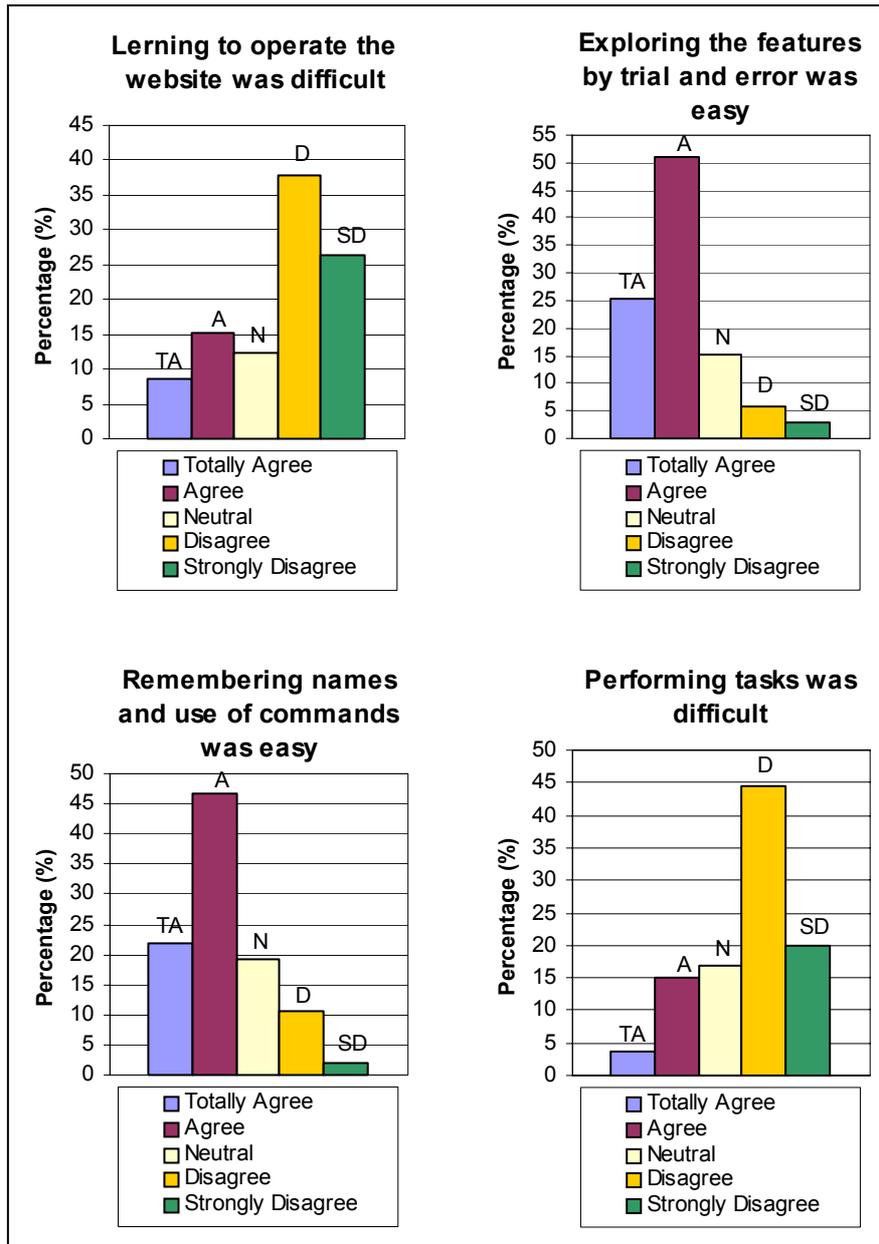
Figure 4.12: Learners' experience of learning the website

The majority of learners disagreed (total 64,16 per cent: 37,74 per cent disagreed and 26,42 strongly disagreed) with the statement "Learning to operate the website was difficult". Nearly 24 per cent of the learners agreed with the statement (17,92 per cent agreed and 16,98 per cent totally agreed), while 12,26 per cent rated the statement neutral. The difficulty learners experienced in learning to operate the website could be ascribed to the large number of learners who had no or little exposure to computers and/or the Internet. However, there were learners who were using the Internet for the first time and who experienced no real difficulties in operating it. After the introduction session one of the learners remarked:

 "I cannot believe it. I have learned to work the Internet in such a short time and it was so easy!" (Snail, 2003).

Most of the learners agreed with the following two statements and disagreed with the third statement concerning with learning the website:

- Exploring the features by trail and error was easy (total 76,41 per cent: 25,47 per cent totally agreed and 50,94 per cent agreed).
- Remembering names and use of commands was easy (total 68,57 per cent: 21,90 per cent totally agreed and 46,67 per cent agreed).
- Performing tasks was difficult (total 64,15 per cent: 44,34 per cent disagreed and 19,81 strongly disagreed).

4.3.8   Read the statements below and give your (the learner's) view on the website

It is important to establish whether the learners feel that the website serves as a tool that can assist them in mastering the subject content. The features listed below were evaluated to establish whether the website met this criterion:

- Whether the website can assist them in understanding the subject content in the study guide better
- Whether the questions and activities in the website can assist them in understanding the subject principles better
- Whether working through the website made them more confident about answering their assignment questions better

Figure 4.13 on the next page comprises statements and graphical representations of how the learners viewed the website as a tool that can assist them in mastering the subject content according to the features listed above.
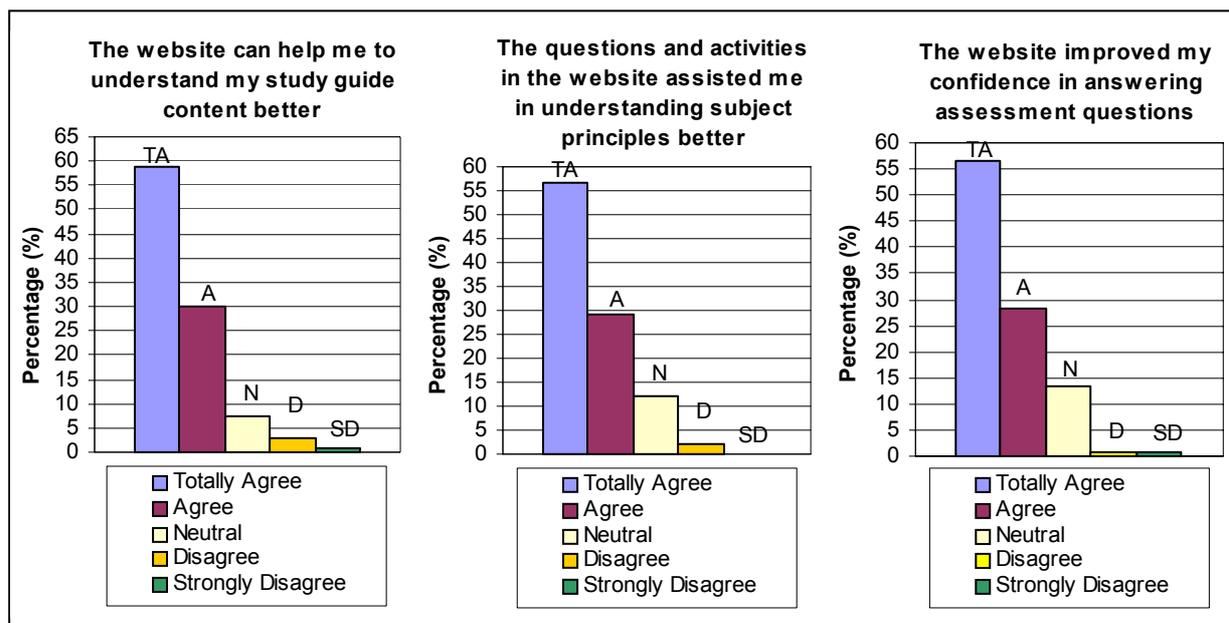
Figure 4.13: Learners' view of the website

A large number of learners reacted very positively to all three of the statements that revealed the extent to which the website had assisted them (or not) in mastering the subject content. The results were as follows:

- The website can help me to understand the subject content in my study guide better (total 88,79 per cent: 58,88 per cent totally agreed and 29,91 per cent agreed).
- The various questions and activities in the website can assist me in understanding the subject principles better (total 85,85 per cent: 56,60 per cent totally agreed and 29,25 per cent agreed).
- Working through the website makes me more confident about answering my assessment questions better (total 84,90 per cent: 56,60 per cent totally agreed and 28,30 per cent agreed).

From the results it is clear that the learners are of the view that a website can serve as tool to assist them in acquiring a better understanding and knowledge of the subject matter. During follow-up discussions the learners again confirmed that they viewed the website as a means that could help them to master the subject matter. They also viewed the website as a means of obtaining more background information about the subject matter because the subject is unfamiliar to most of them. The website also serves as a reliable source of correct information concerning nutrition. People are often misinformed about nutrition in general and – to an even greater extent – about the facts that are pertinent to nutrition and HIV and AIDS.

4.3.9 How did you (the learner) experience the online format of the exercises?

Although a large number of the learners had had little or no exposure to the use of computers in their studies, they managed to execute the exercises with much less effort that had been expected. During the observation sessions it was encouraging to see how quickly the majority of the learners mastered the *example* exercise that comprised a *drag and drop* activity. The drag and drop approach was a totally new concept to most of the learners since those that were familiar with computers only possessed experience in basic word processing tasks. After they understood how to operate the mouse and read the exercise instructions, they completed the *example* exercise with little effort. There was much excitement amongst the learners when they completed the exercise and scored one hundred per cent. They had even less trouble executing the content exercises since they comprised typing activities or clicking check box activities. The features listed below were used to evaluate the online format of the exercises:

- Whether learners found it difficult to complete the online exercises
- Whether learners found the exercises easy to perform
- Whether learners would have preferred to do the exercises in a pen-and-paper format
- Whether the online format made the exercises more interesting
- The use of the mouse (the drag and drop activity)

Figure 4.14 on the next page comprises statements and graphical representations of how the learners experienced the online format of the exercises in terms of the features listed above.
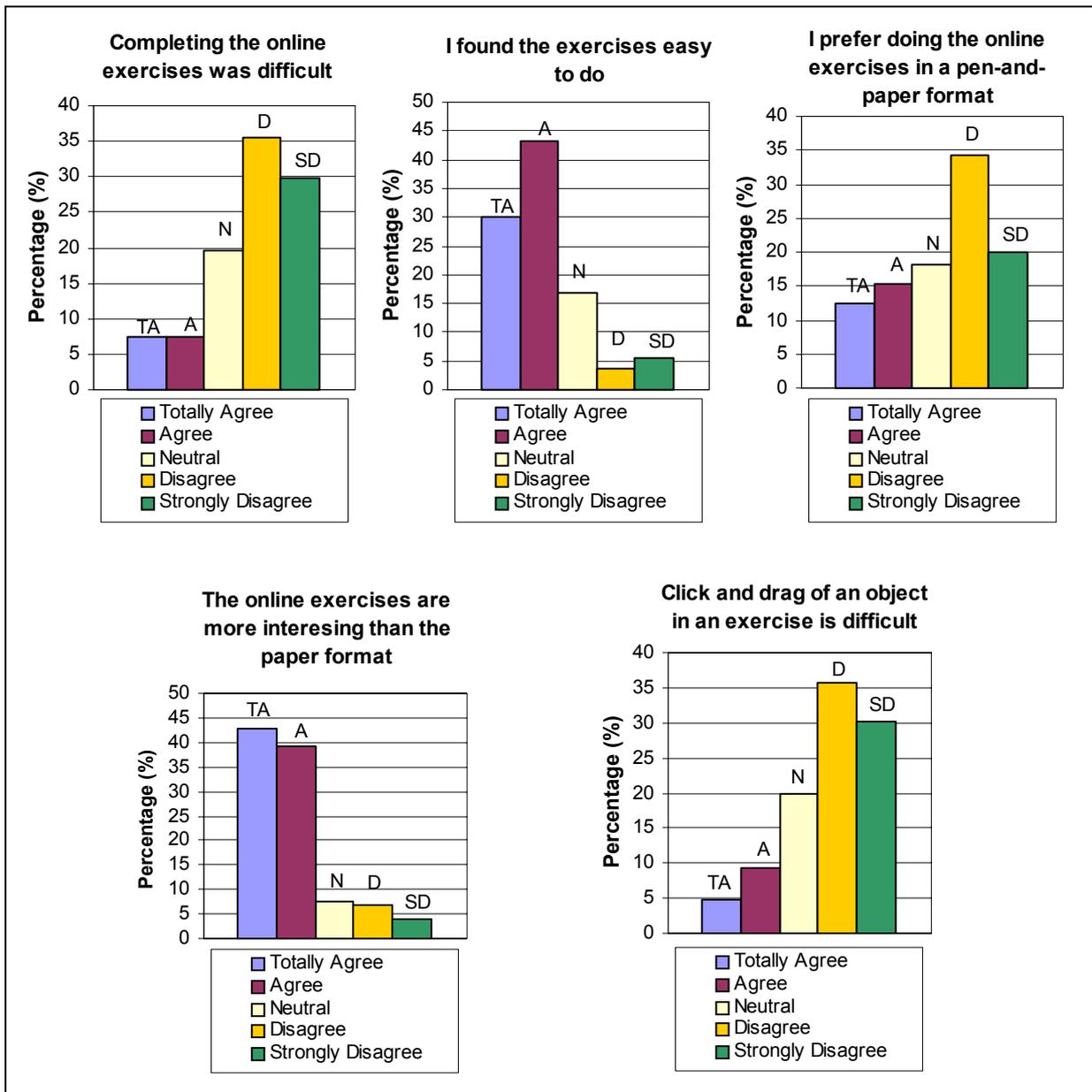
Figure 4.14: Learners' views of the online format of exercises

Most of the learners did not find it difficult to complete the online exercises (total 65,42 per cent: 35,51 per cent disagreed and 29,91 totally disagreed). Fifteen per cent of the learners agreed with the statement "I found it difficult to complete the exercises because of the online format", while 19,63 per cent rated the statement neutral. The majority of learners also agreed that the exercises were easy to do (total 73,59 per cent: 30,19 per cent totally agreed, and 43,40 per cent agreed). Fewer than ten per cent of the learners found the exercises difficult.

It is encouraging to note that more than half of the learners preferred the online format of the exercises. Fifty-four per cent of the learners disagreed with the statement "I would have preferred to

do the exercises of the website in a pen-and-paper format" (34,29 per cent disagreed and 20,00 per cent totally disagreed). Nearly 28 per cent of the learners agreed with the statement while 18,10 per cent rated the statement neutral. The relatively high neutral rating could be interpreted to show that these learners did not mind in which formant the exercises were presented and that they thus viewed the online format as acceptable.

Although a substantial number of learners would have preferred to complete the exercises in a pen-and-paper format, nearly 82 per cent of the learners agreed with the statement "The online format made the exercises more interesting than the equivalent pen-and-paper format" (42,86 per cent totally agreed and 39,05 per cent agreed). Only 10,48 per cent disagreed with the statement and 7,62 per cent rated the statement neutral.

Just more than 14 per cent of the learners agreed with the statement "In the activities I found it difficult to click on an object and drag it to another position". Most of the learners disagreed with the statement (total 66,04 per cent: 35,85 disagreed and 30,19 totally disagreed) while nearly 20 per cent rated the statement neutral.

4.3.10 General statements

The following features were evaluated in order to establish the learners' perceptions about the website:

- Whether the website enhanced and improved the learners' skills
- Whether the website assisted them in improving the quality of their work
- Whether the website made a good impression
- Whether learners would tell their friends positive things about the website

Figure 4.15 on the next page comprises statements and graphical representations of the learners' views concerning the website in terms of the features listed above.
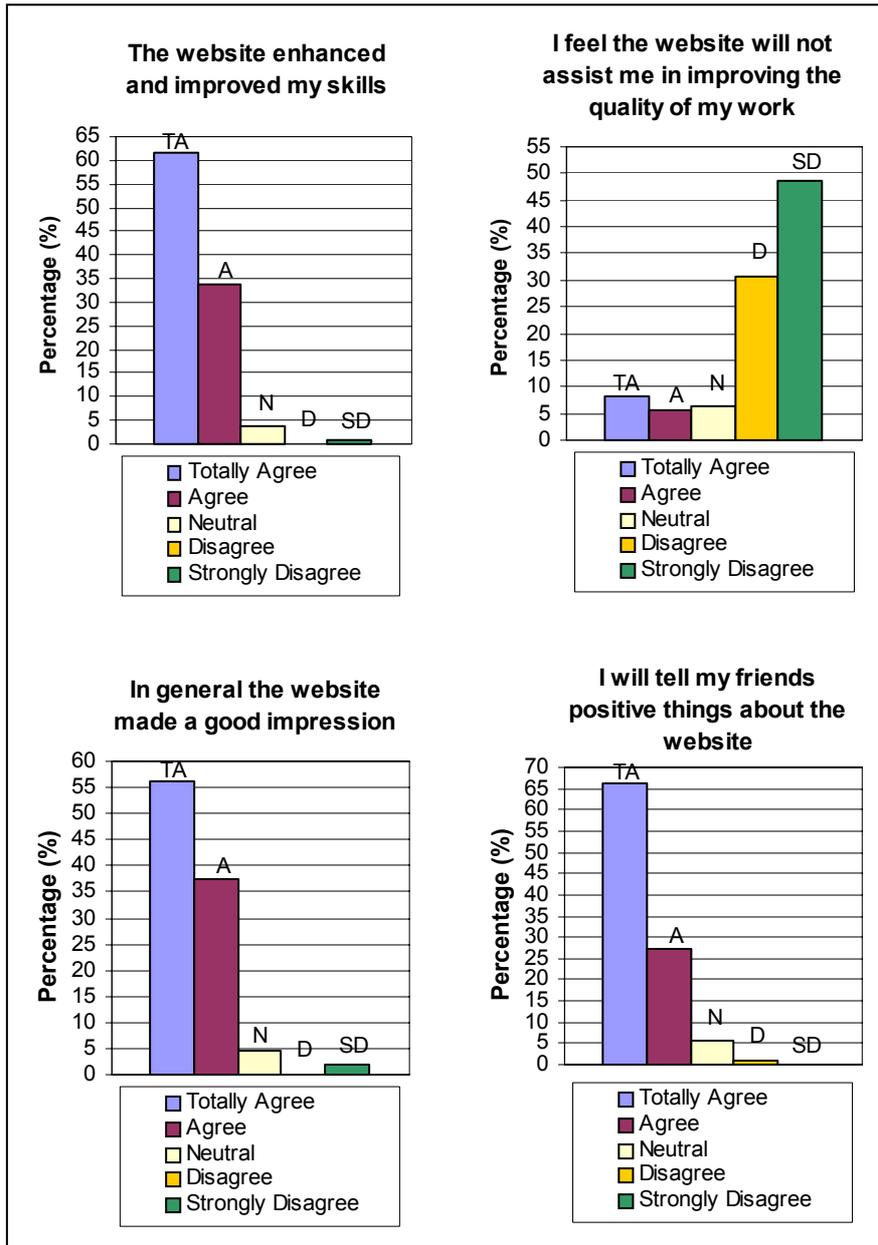
Figure 4.15: Learners' views on general statements concerning the website

A large number of the learners (95,32 per cent) agreed with the statement "I feel the website enhanced and improved my skills" (61,68 per cent totally agreed and 33,64 per cent agreed). Only 0,93 per cent of the learners disagreed with the statement and 3,74 per cent rated the statement neutral.

The majority of learners (79,44 per cent) disagreed with the negative statement "A website will not assist me in improving the quality of my work" (30,84 per cent disagreed and 48,60 per cent strongly disagreed). Fourteen per cent of the learners agreed with the statement (8,41 per cent totally agreed and 5,61 per cent agreed) and 6,53 per cent of the learners rated the statement neutral.

Most of the learners (93,45 per cent) also agreed with the statement "In general the online module made a good impression". Only 1,87 per cent strongly disagreed with the statement while 4,67 per cent rated the statement neutral. The same percentage of learners (93,46 per cent) agreed with the statement "I will tell my friends positive things about the web-base". A small number of learners (0,93 per cent) disagreed with the statement, while 5,61 per cent rated the statement neutral.

Because an overwhelming number of learners indicated that the website improved their skills, and felt that it would assist them in improving the quality of their work and said that they would tell their friends positive thing about the learning website, further e-learning development of the degree is viable and needs to be considered.

4.4   Questionnaire C: Summative evaluation of the distance education course and the website

In this section the results from the quantitative analysis of the formative evaluation of the distance education course and website (See Appendix D, Questionnaire C) are reported and discussed. Since there was no significant difference between variables of the summative evaluation of the two year groups, the data was combined and the results are reported as such.

The first part of the questionnaire covers how learners experienced working with the website while the latter focuses on how the learners viewed the course. The questionnaire comprises a number of questions; each is followed by a number of statements related the question. The learners had to respond by indicating which statement(s) are the most applicable to himself or herself. The results of Questionnaire C are reported as a question followed by graphic representations reflecting how learners rated the statements, and these are interpreted in terms of frequency percentages. A brief discussion follows each question.

4.4.1   How did you experience working with the website?

The website also functions as a supplement to the black-and-white paper-based study material to provide more visual and interactive content. The features listed below were evaluated to establish how learners experienced working with the website:

- Whether the learners were impressed with the website
- Whether they found website challenging
- Whether they found website stimulating
- Whether they enjoyed working with the website
- Whether they found the website easy to use
- Whether the website frustrated them
- Whether they felt using the website was a waste of time

Figure 4.16 and Figure 4.17 comprise statements and graphical representations of how the learners experienced working with the website according to the features listed above.
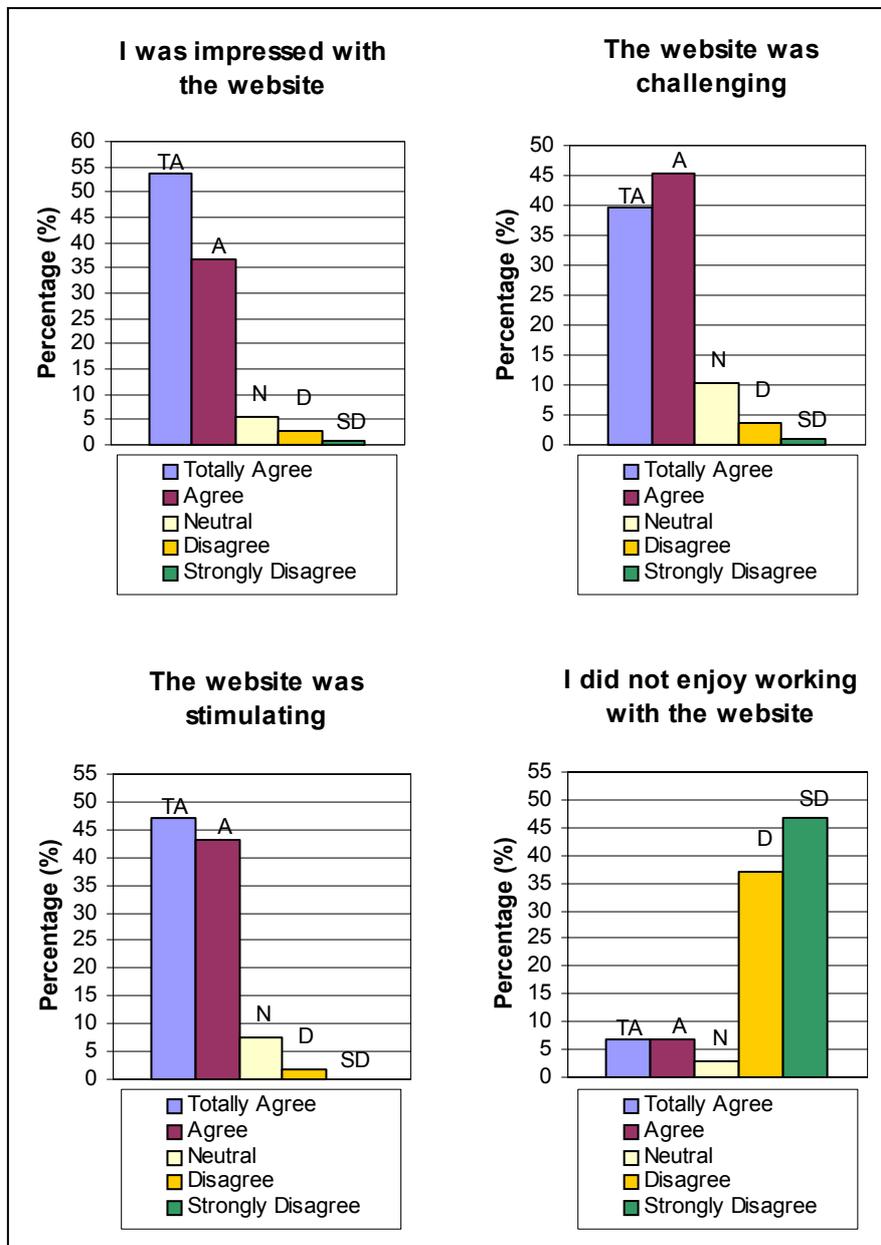

Figure 4.16: How learners experienced working with the website
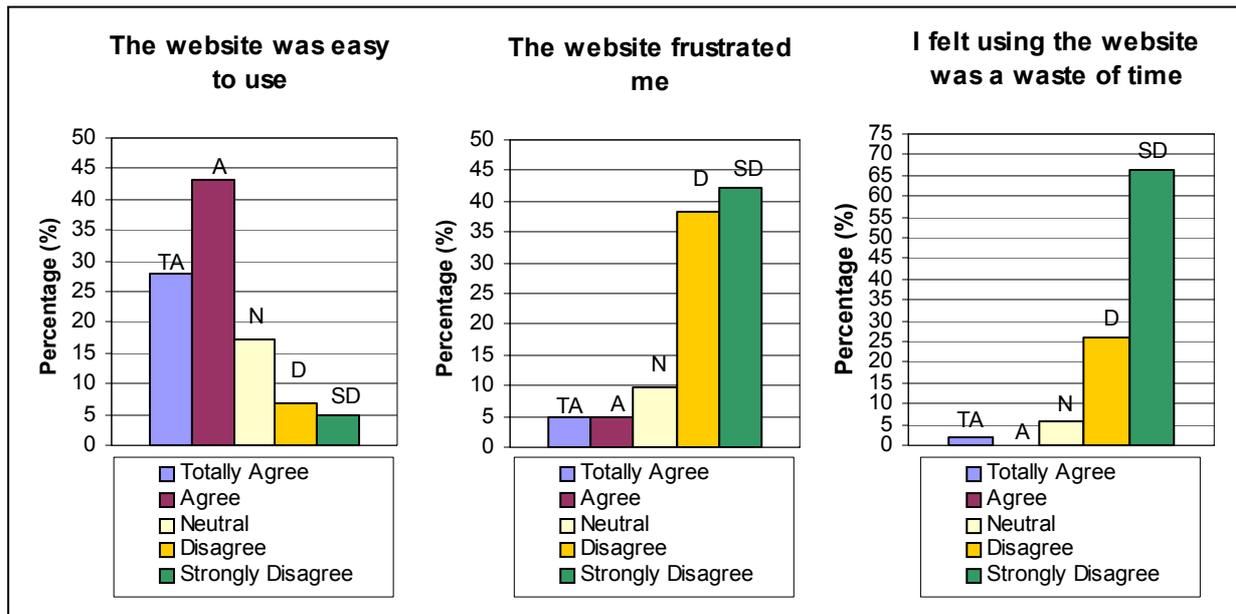
Figure 4.17: How learners experienced the website (continued)

The majority of learners reacted positively to the following three the statements concerning working with the website. The results were as follows:

- I was impressed with the website (total 90,56 per cent: 53,77 per cent totally agreed and 36,79 per cent agreed).

- The website was challenging (total 84,90 per cent: 39,62 per cent totally agreed and 45,28 per cent agreed).

- The website was stimulating (total 90,39 per cent: 47,12 per cent totally agreed and 43,27 per cent agreed).

A total of 83,81 per cent of the learners disagreed with the statement "I did not enjoy working with the website" (37,14 per cent disagreed and 48,67 per cent strongly disagreed). A small number (2,86 per cent) of learners rated the statement neutral while 13,34 per cent agreed with the statement. The relatively large number of learners who agreed with the statement is an indication that there are a number of learners who are not comfortable with using computer technology. This lack of ease might be attributable to the fact that the learners were computer illiterate and that the prospect of using an unfamiliar technology would make them feel uncomfortable. They may also feel that they are not able to master this "new" technology or that they do not think that it is really necessary (in the wider context) to master these skills. There may also be learners that just do not like with computers, or who just find it difficult to do so.

A large number of learners agreed (71,15 per cent) with the statement "The website was easy to use" (27,88 per cent totally agreed and 43,27 per cent agreed). However, a notable number of learners (11,54 per cent) did not agree with the statement, while 17,31 per cent of the learners rated

the statement as neutral. These relatively high percentages of negative and neutral responses to this question support the findings from the previous paragraph that indicated that learners who disagreed with this statement might be computer illiterate or might experience difficulties in mastering this "new" technology.

The majority of learners disagreed with the following two statements concerning working with the website. The results were as follows:

- The website frustrated me (total 80,77 per cent: 38,46 per cent disagreed and 42,31 per cent strongly disagreed).
- I felt using the website was a waste of time (total 92,31 per cent: 25,96 per cent disagreed and 66,35 per cent strongly disagreed).

It is encouraging to note that the majority of learners experienced working with the website as a positive experience.

4.4.2   What is your (the learner's) view on the website?

During informal discussions with learners and comments from learners it became apparent that learners did not know where to find appropriate and relevant information about the subject matter and that they experienced difficulty in finding the information. They were also not able to gain adequate background information. It was clear that the learners lacked the skills to find and use information from sources other than what was already present in their prescribed study material. The learners also experienced difficulty in adjusting to the increased personal input that the degree required from them. The website attempts to assist and guide learners on how to acquire and improve the skills they are lacking while functioning as a tool to support the distance education course. The features listed below were evaluated to establish how learners viewed the website:

- Whether they enjoyed working with the website
- Whether they would make use of the website when studying
- Whether they felt that the online content would help them to understand the printed study material better
- Whether they found the activities in each unit useful

Figure 4.18 on the next page comprises statements and graphical representations of how the learners experienced working with the website according to the features listed above.
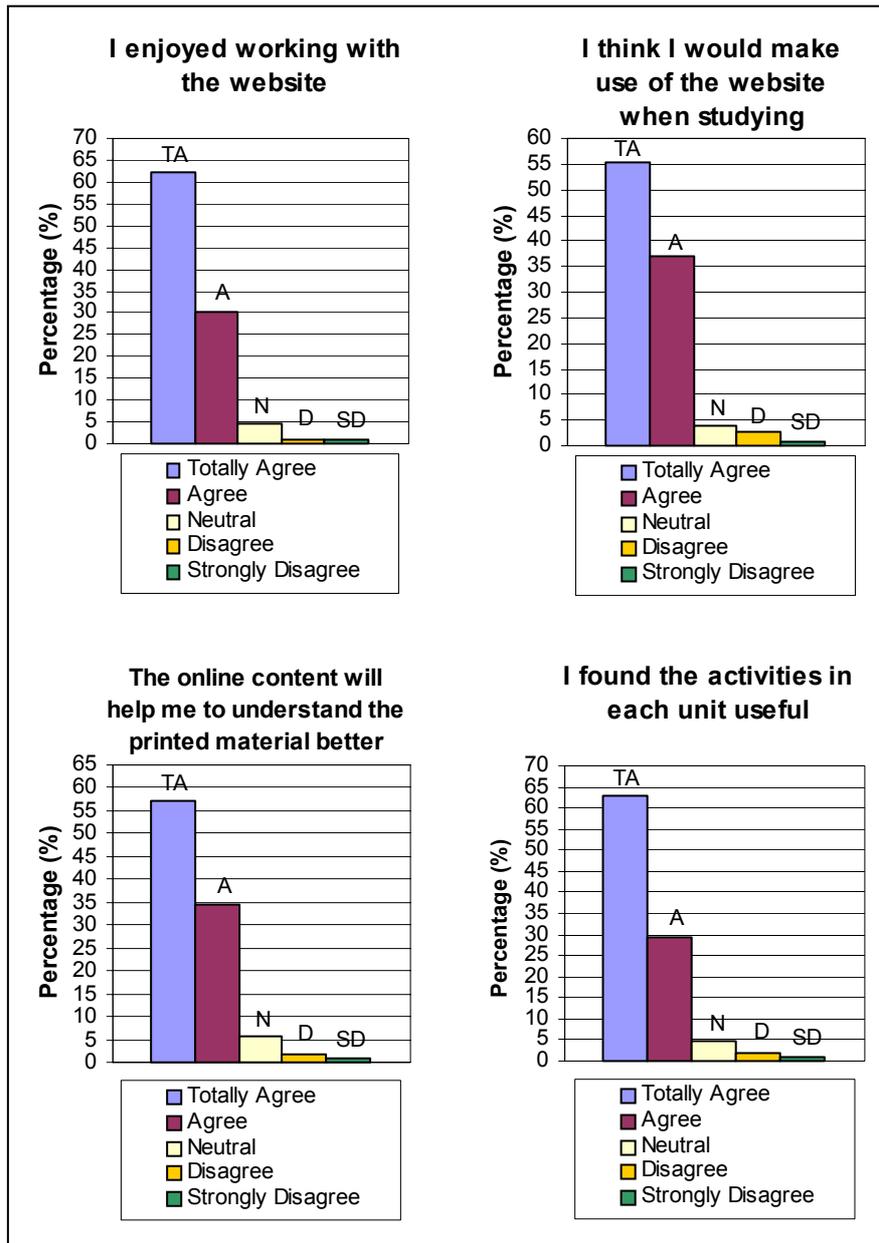
Figure 4.18: Learners' view on working with the website

The majority of learners agreed with the statements concerning their view on the website. The statements and the result are as follows:

- I enjoyed working with the website (total 92,45 per cent: 62,26 per cent totally agreed and 30,19 per cent agreed).

- I think I would make use of the website when studying (total 92,38 per cent: 55,24 per cent totally agreed and 37,14 per cent agreed).

- The online content will help me to understand the printed study material better (total 91,43 per cent: 57,14 per cent totally agreed and 34,29 per cent agreed).

- I found the activities in each unit useful (total 92,38 per cent: 62,86 per cent totally agreed and 29,52 per cent agreed).

It is encouraging to see that such a large number of learners reacted positively to the website and that they feel that the course will help them to understand the printed material better.

4.4.3   Do you (the learner) use e-mail to communicate with your lecturers and fellow learners about your studies?

One of the objectives of the degree is to encourage the learners to make use of electronic media for their studies. VISTA University provided a facility for learners to have their own VISTA e-mail address. I needed to establish whether the learners did make use of e-mail to communicate with the lecturers and fellow learners.

Figure 4.19 comprises statements and graphical representations of learners' response to the question "Do you use e-mail to communicate with your lecturers and fellow learners concerning your studies?".
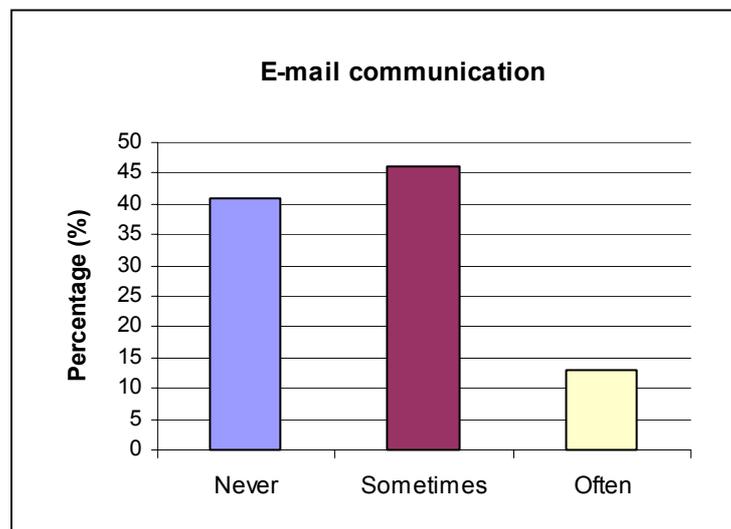
Figure 4.19: Learners' response on using e-mail as means of communication

Forty-one per cent of the learners indicated that they never use e-mail, 46 per cent use e-mail sometimes and only 13 per cent indicated that they use e-mail often for this purpose. It is unfortunate that so few learners make use of e-mail communication. During informal discussion the learners who did make use of e-mail indicated that they found e-mail a very convenient means of communication, especially when they could not get hold of the lecturer personally.

4.4.4 Would you prefer to have your study guides and tutorial letters available online?

Although the learners are issued with **all** the printed study material after registration, the degree management committee felt that study material should also be available online. It was also necessary to determine how learners felt about having their study material available online.

Figure 4.20 is a graphical representation of the learners' response to the question "Would you prefer to have your study guide and tutorial letters available online?".
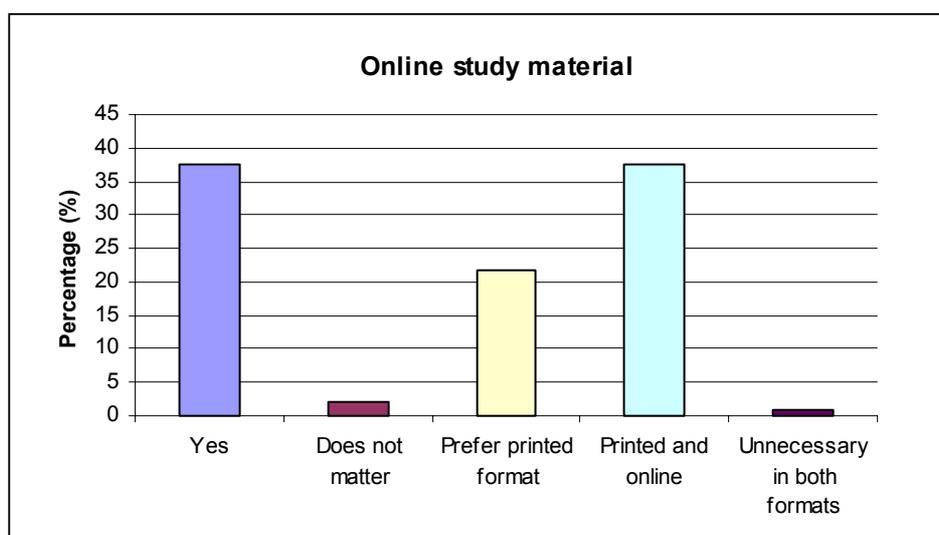
Figure 4.20: Learners' responses to having study material available online

The majority of learners either indicated that they preferred to have their study material available online (37,62 per cent) or to have their study material in printed *and* in online format (37,62 per cent). Nearly 22 per cent of learners preferred the printed format. Less than five per cent felt it did not matter in which format they receive their study material or that it is unnecessary to have both formats. It is encouraging to see that such a large number of the learners are in favour of the study material being available online.

It often happens that learners who register by post or register late receive their posted study material very late. Thus, if the study material is available online, such learners can access it immediately after registration and begin to complete the assignments. In some instances learners are issued with incorrect study material or incomplete study material. If the material is online they can also check if have the correct study material without having to contact the university. Learners also mislay their study material, especially their tutorial letters and assignments. Instead of applying for another copy and then waiting for the time-consuming issuing and posting process, learners can download another copy immediately.

4.4.5   Would you (the learner) prefer to send your assessment activities by e-mail?

It was necessary to determine learners' attitude toward using e-mail to submit their assessment activities (assignments). Figure 4.21 is a graphical representation of the learners' response to the question as to whether they would prefer to send their assessment activities by e-mail.
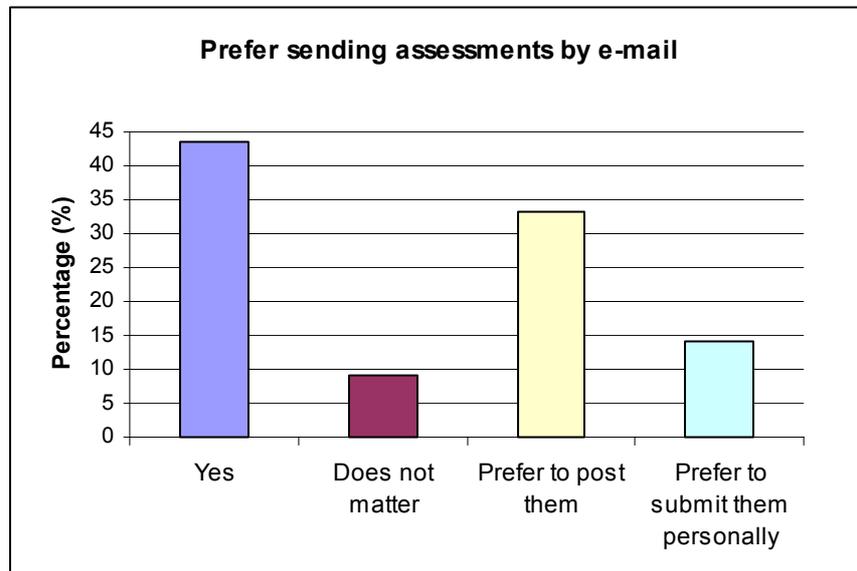
Figure 4 21: Learners' response on sending assessments by e-mail

A large number of learners (43,43 per cent) indicated that they would prefer to send their assessments by e-mail. Nearly 22 per cent of learners preferred to post their assessments while 14,14 per cent preferred to submit their assessments personally.

4.4.6   Would you (the learner) prefer to receive the marked assessments back by e-mail?

I needed to establish learner preferences concerning the return of their marked assessments. Figure 4.22 is a graphical representation of the learners' response to the question as to whether they would prefer to receive their marked assessments back by e-mail.

Receive marked assessments by e-mail
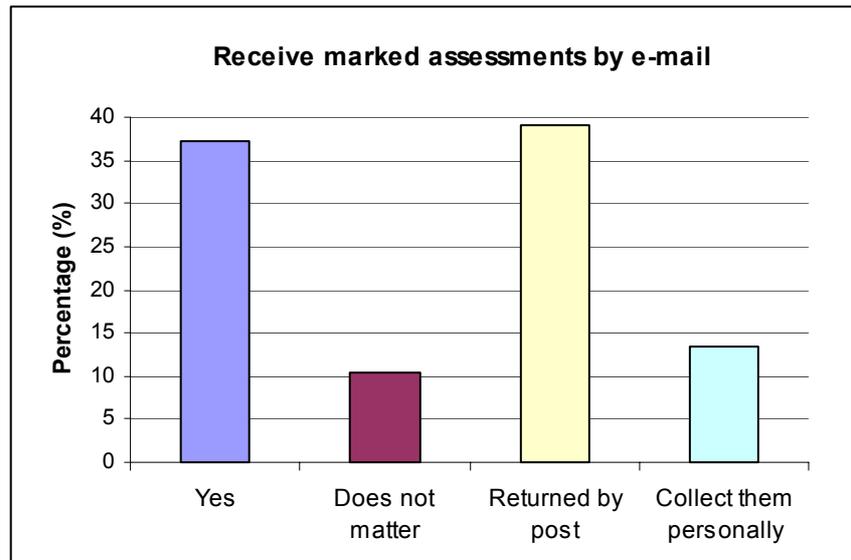
Figure 4.22: Learners' responses to receiving marked assessments by e-mail

A slightly lower percentage of learners (37,11 per cent) would prefer to receive their marked assessments back by e-mail than those that would prefer to send their assessments by e-mail. This could be due to the fact that quite a number of learners do not have their own e-mail address but use another person's e-mail address. They might not feel at liberty to use another person's e-mail address to receive their marked assessments back. This may explain why this number would rather receive the marked assessment back by post. Thirty-nine per cent of the learners prefer to receive their marked assessment back by post. A number of learners (13,40 per cent) would prefer to collect the marked assessment personally. The main reasons for learners delivering and collecting their assessments *personally* is because of the unreliable postage system, especially in the more rural areas.

A number of learners noted that they had not realized that e-mailing assessments were so effective. They were especially impressed with the fact that the assessments *did not get lost* and that they received the marked assessments back in a much shorter time than they would via the post. The lecturer (me) also arranged with the learners to receive a notification of receipt from the lecturer as soon as she had received the e-mailed assessment. This ensured that the learners knew that their assessment had arrived at the lecturer. If they did not receive a notification within 36 hours, they were asked to resubmit the assessment.

4.4.7   Combination of media and technology learners would prefer for their studies

To establish what combination of media and technology learners would prefer to use during their studies, the following features were evaluated:

- Whether learners preferred to use only their printed study material
- Whether learners would use other printed sources (e.g. library books)
- Whether learners would use the Internet to gather information
- Whether learners would use only telephone, fax and mail to communicate with the lecturers and fellow learners
- Whether learners would use e-mail and telephone to communicate with the lecturers and fellow learners
- Whether learners would only consult the lecturer in her/his office and prefer not to use other means of communication

Figure 4.23 on the next page comprises statements and graphical representations of what combination of media and technology learners would prefer to use according to the features listed above. (Learners were allowed to choose more than one option.)

Using combinations of technology and media for studies

■ (blue)	I will only use my printed material, such as my study guide, tutorial letters and prescribed textbooks.
■ (dark red)	I will also use other reference sources in printed form (e.g. library books and journal articles).
■ (pale yellow)	I will use the Internet to gather information for my studies.
■ (light cyan)	I plan to communicate only via telephone, fax and mail with my lecturer and fellow learners.
■ (purple)	I plan to use e-mail and telephone to communicate with my lecturer and fellow learners.
■ (salmon)	I plan to only consult the lecturer in her/his office, I prefer not to use other means of communication.

Figure 4.23: Media and technologies learners prefer to use during their studies

It was clear that the learners have a preference for using printed materials. It is disturbing to see from the results that such a large number of learners (46,73 per cent) at postgraduate level are of the opinion that their study guide and prescribed textbooks are sufficient sources for their studies. In a field of HIV and AIDS, in which new information is constantly being published, it is very important for learners to realize that they must consult other sources in order to be informed about the latest information concerning the subject matter. However, more than half of the learners (57,94 per cent) indicated that they would use other printed sources and 42,99 per cent indicated that they would also use the Internet to gather information.

Learners also showed a greater preference for using the telephone, fax and mail when it comes to matters concerning their studies. Twenty-five per cent of the learners indicated that they would prefer to use the telephone, fax and mail to communicate with the lecturers and fellow learners than

those that would use the telephone and e-mail (23,36 per cent). Thirteen per cent of the learners preferred to consult the lecturers in their offices.

4.4.8   Preferred modes of communications

Learners were asked which modes of communication they would prefer to use. Figure 4.24 comprises the communication options and graphical representations of the various modes of communication offered. (Learners were allowed to choose more than one option.)

Preferred modes of communication
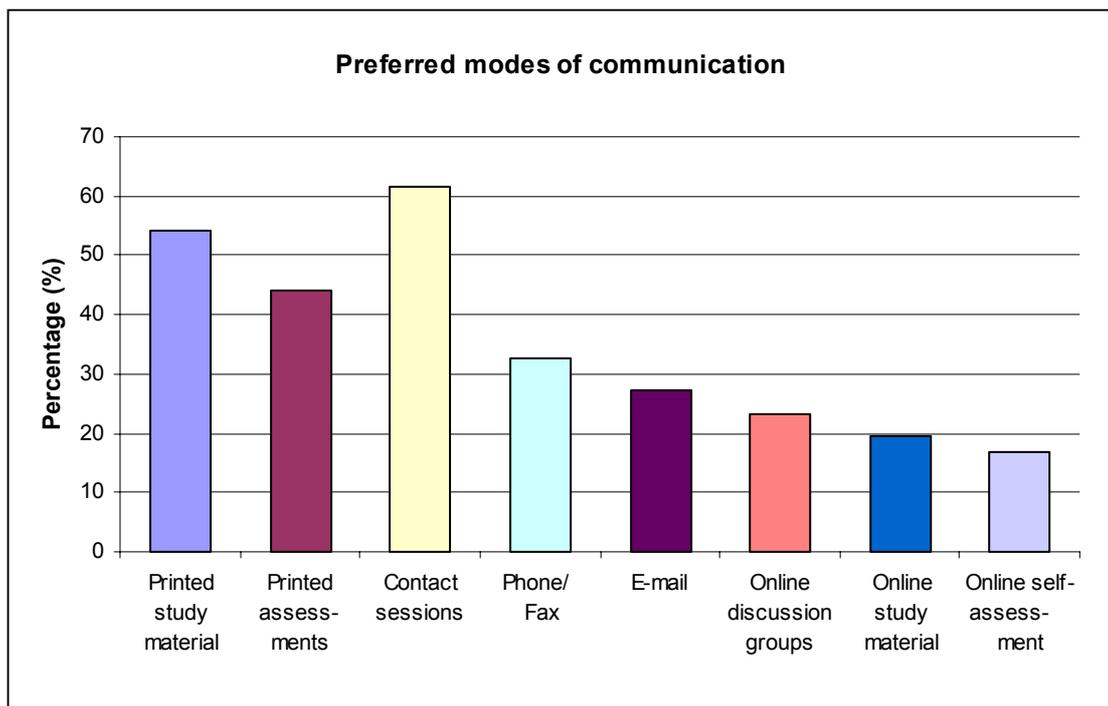
Figure 4.24: Learners' preferred mode of communication

From the results it is clear that the learners have a distinct preference for printed study materials and assessments (54,21 per cent and 43,93 per cent respectively) and contact sessions (61,66 per cent). It is noteworthy that although these learners are postgraduate students and the degree is offered in a distance education mode, they still have a strong preference for contact sessions. The preference percentages for the various electronic modes of communication were much less than for the printed media, and varied between 27 per cent and 16 per cent.

The lower incidence of preference for electronic communication could be explained by the fact that the learners are not familiar with the use of electronic communication. Learners also indicated that that they did not have e-mail and Internet facilities – or, in those cases where they have access to these facilities at work, they were not allowed to use them for private purposes. They were, however, permitted to use telephone and fax facilities (if they paid for such use) for private and study purposes. Learners and employers should be made aware of the fact that their employees might

need to use an e-mail facility on a limited basis to further their education and enhance their qualifications.

4.4.9   Would you prefer to receive instruction through a combination of media and technology?

Learners were asked if they would prefer to receive instruction by means of a combination of media and technology. Figure 4.25 comprises the response options and graphical representations to the posed question.
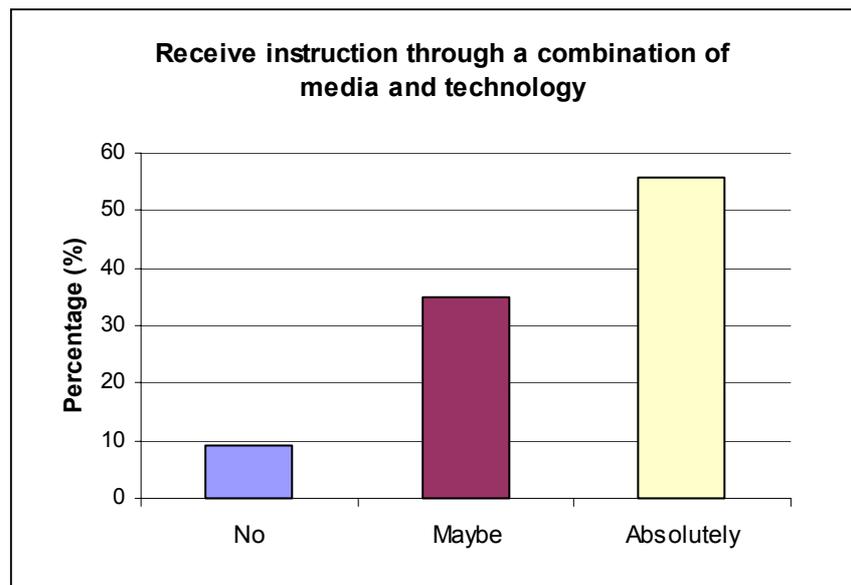
Figure 4.25: Instruction offered through a combination of media and technology

The majority of learners responded positively (55,67 per cent) to the idea of receiving instruction through a combination of media and technology. Thirty-five per cent of the learners were unsure about receiving instruction through a combination of media and technology. This may indicate that although learners are not opposed to the use of media and technology, the principle is still new and unfamiliar to them. Learners need to be informed about the use of various forms of media and technology, and time is needed to teach them how to use it in such a manner that it becomes a part their way of study.

I noticed an increase in the acceptance of e-mail among the learners and, to a lesser extent, the use of the Internet. However, it has become apparent that very few learners have been made aware of the importance of academic journal articles in their undergraduate studies. The idea of an electronic journal database is therefore very unfamiliar to them. Learners urgently need to be made aware of facilities such as these.

4.4.10 Which of the following formats would you prefer to have available for instruction?

Learners were given a number of media and technology options to determine their views on the use of these facilities when offering instruction. (They were allowed to choose more than one option.) Figure 4.26 comprises the media and technology options and graphical representation of their selections.
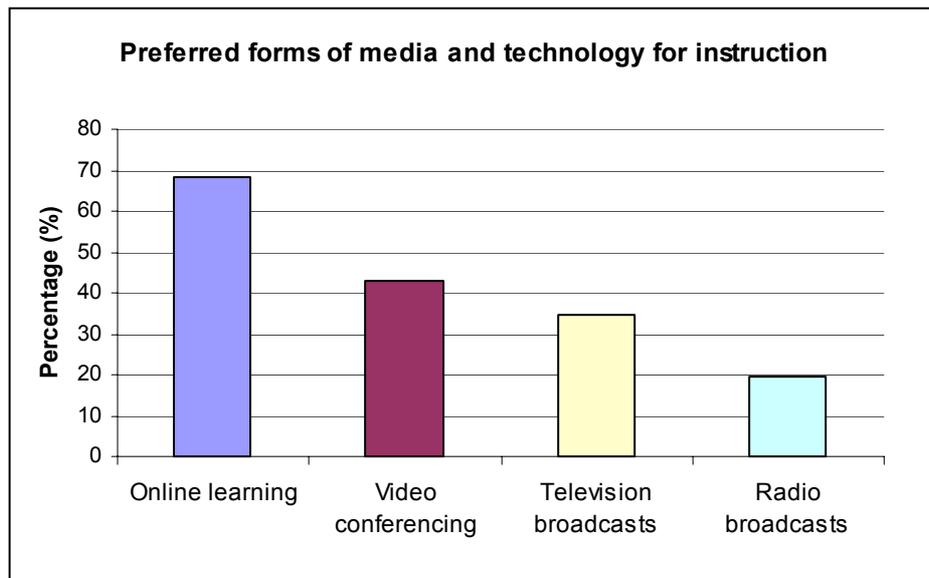
Figure 4.26: Preferred forms of media and technology used for instruction

It was encouraging to see that the majority of the learners (68,22 per cent) rated online learning the preferred option. Forty-three per cent considered video conferencing as a preferred option. Nearly 35 per cent considered television broadcasts as a preferred option, and nearly 20 per cent considered radio broadcasts as a preferred option.

During 2003 videoconferencing was used to accommodate learners in the Eastern Cape. However, we did experience a number of technical problems and some learners who indicated that they would attend the videoconference did not turn up. Videoconferencing is viewed as a viable option and will be used in future. Infrastructure for television broadcasts are not available at present but may be considered as an option for the future. Radio broadcasts are not considered at present since audiotapes are considered a better and cheaper option if the need arises.

From the results one can see that although some of the learners enrolled for the degree in Social Behavioural Studies in HIV and AIDS have no or little exposure to media other than the printed format the learners in general are willing to use other media and technology for their studies. The next section discusses results form hypotheses formulated concerning the e-learning website.

4.5   Hypothesis

A number of hypotheses concerning the learning website and the use of a combination of media and technology for adult distance education learners from previous disadvantaged communities were tested. Each hypothesis will be stated below. Each will be followed by a brief discussion on the findings concerning the hypothesis.

4.5.1   Methods of testing hypotheses

❑   **The Chi-square test (χ^2)**

The Chi-square test for two-way frequencies was used to test the two hypotheses stated in Table 4.5. In all cases the test was conducted at the 95% significance level. In the case of all the variables: if the probability value (p-value) was less than 0,05, there was a statistically significant relationship between the variables and the stated hypothesis was accepted.

The *Binomial Test* for proportions was used to test the hypotheses stated in Table 4.6. In all cases the test was conducted at the 95% significance level. For all the variables: If the p-value was less than 0,05 the stated hypothesis was rejected.

4.5.2   Hypotheses concerning the e-learning website

Table 4.5 on the next page lists the formulated hypotheses, the probability value, and the results from the Chi-square test. A brief discussion of the results follows Table 4.5.

Table 4.5: Hypotheses tested using the Chi-square test

Hypothesis	p-value	Result
There is no difference in the proportion of learners 29 years and younger who view themselves as computer literate when compared with the proportion of learners who are 30 years and older.	p = 0,02	There is a relationship between the age of the learners and their computer literacy; therefore the hypothesis is rejected.
There is no difference in the proportion of male learners who view themselves as computer literate when compared with the proportion of female learners.	p = 0,96	There is no relationship between the computer literacy of males and females; therefore the hypothesis is accepted.

The result stated in Table 4.5 concerning the hypothesis, namely, *There is no difference in the proportion of learners 29 years and younger who view themselves as computer literate when compared with the proportion of learners who are 30 years and older* indicates that there is a relationship between the age of the learners and the learners' view (perception) of their level of computer literacy.

Under the sub-heading *Age groups* in section 4.5.3 below, more information about this hypothesis that focuses on the role that age plays in the planning and development of e-learning courses, will emerge.

It is notable that there is no relationship between male and female levels of computer literacy. This is contradictory to what I expected and what has been reported in the literature concerning females that in general are less inclined to show interest in and use computers and related technology. The results indicate that it is not true in this case. I in fact noticed from working with these learners that the female learners made *more* of an effort to improve their computer skills. The work submitted shows that the female learners ranged in their skills from good to highly computer literate. This could be because older women have more life-experience (than the fist year learners) which has changed their attitudes or in the case of these older women it is as Moore (1994:26) has indicated that when they started using computers their perception of computers become more positive.

Table 4.6 on the next page lists the hypotheses using the Binomial test for proportions. The table also comprises probability values, the obtained percentages and the results. A brief discussion on the results is given after Table 4.6.

Table 4.6: Hypotheses tested using the Binomial test for proportions

Hypothesis	p-value	Percentage	Result
Fifty per cent of the learners viewed themselves as computer literate	p = 0,38	48,51	The proportion does not differ significantly from the 50 per cent level; therefore the hypothesis was accepted.
Fifty per cent or less of the learners found the visual presentation of the screen display acceptable	p < 0,0001	95,24	The proportion is significantly more than 50 per cent; therefore the hypothesis was rejected.
Fifty per cent or less of the learners found the font size readable and acceptable	p < 0,0001	93,40	The proportion is significantly more than 50 per cent; therefore the hypothesis was rejected.
Fifty per cent or less of the learners found the graphics effective and clarified the content	p < 0,0001	85,98	The proportion is significantly more than 50 per cent; therefore the hypothesis was rejected.
Fifty per cent or less of the learners found the e-learning website user friendly and easy to use	p < 0,0001	89,72	The proportion is significantly more than 50 per cent; therefore the hypothesis was rejected.
Fifty per cent or less of the learners felt that the e-learning website will assist them in improving the quality of their work	p < 0,0001	79,44	The proportion is significantly more than 50 per cent; therefore the hypothesis was rejected.
Fifty per cent or less of the learners enjoyed working with the e-learning website	p < 0,0001	83,81	The proportion is significantly more than 50 per cent; therefore the hypothesis was rejected.

The results from Table 4.6 indicate that only the first hypothesis concerning the percentage of learners who view themselves as computer literate, was accepted. It was not expected that such a large number of learners (48,51 per cent) would view themselves as computer literate. Although this number is still low, it is encouraging to see that nearly 50 per cent of the learners regard themselves as computer literate. Learners who are not computer illiterate must be encouraged to become computer literate. I noted in discussions with learners that a number of learners attempted to improve their computer skills. I noticed this improvement with the submission of each successive group of assignments. More learners submitted their assignments in the printed format. The quality

of their typing skill improved, less typing errors were made, the structure and presentation also improved.

The hypotheses on the visual presentation of the screen display, the font size and the graphic display were all rejected. This indicates that the majority of learners viewed these features positively. These results support the results obtained in sections 4.3.1, 4.3.2 and 4.3.4.

The hypotheses on the extent to which the learners experienced the website as user friendly and easy, on how much they enjoyed working with the website, and whether or not they felt that the website would assist them in improving the quality of their work, were all rejected. This indicates that the majority of learners viewed these features positively. These results support the results obtained in sections 4.3.6, 4.3.10 and 4.4.1.

4.5.3   Differences between sub-groups

This section describes the findings that emerged from analysing the following selected sub-groups in an attempt to establish whether these groups differed in their responses to a number of variables from the questionnaires. The variables investigated were:

- I have access to a computer for my studies
- I view myself as computer literate
- I have access to the Internet
- The screen layout was good and easy to read
- The font appearance was pleasing to the eye
- The font size was readable and acceptable
- The graphics were effective and clarified the content
- The navigational indicators was clear and consistent
- I enjoyed working with the website
- The website was easy to use
- The online format made the exercises more interesting than the equivalent pen-and-paper format
- I would make use of the website when studying
- The website will assist me to improve the quality of my work
- I will never use e-mail to communicate with a lecturer and fellow learners
- I would prefer to have their study material made available online
- I would prefer to receive instruction through a combination of media and technology

The variables listed above were investigated in terms of:

- Whether the two age groups differ significantly in their responses to the variables. The ages of the learners raged from 21 years to 53 years. I decided to analyse the relationship between the younger age group (21 to 29 years) and the older age group (30 to 53 years) in terms of the dependent variables listed above.

- Whether there was a significant difference between the responses of males and females in terms of the variables listed above.

- Whether there was a significant difference between the responses of those learners with access to computers for study purposes and those without access to computers for study purposes in terms of the variables listed above.

- Whether the responses of those learners who regarded themselves as computer literate and those who did not regard themselves as computer literate differed significantly in terms of the variables listed above.

- Whether the group of learners with access to the Internet and the group without Internet access differed significantly in terms of their responses to the variables listed above.

I used the Chi-square test (χ^2) for testing independence and differences between variables. The test was conducted at the 5% significance level. For all the variables: if the probability value (p-value) was less than 0,05, a significant difference existed between the variables. In those instances where the variables indicated a significant difference, a more detailed discussion follows.

❑ Age groups

Table 4.7 on the next page shows the results from the Chi-square test, and tests for significant differences between the responses to the listed variables of the age groups 29 years and younger and 30 years and older. The percentages for each age group are given as well as the p-values. The p-value indicated as bold type phase in Table 4.7 is the response that tested a significant difference of a value <0,05.

Table 4.7: Chi-square test results for significant differences between the responses to the listed variables of the age groups 29 years and younger and 30 years and older.

Variables	Age group (%)		p-value
	≤ 29 yr (n=19)	≥ 30 yr (n=65)	
I have access to a computer for my studies	55,56	31,75	0,06
I view myself as computer literate	73,68	46,77	**0,039**
I have access to the Internet	57,89	39,68	0,16
The screen layout was good and easy to read	94,74	92,19	0,58
The font appearance was pleasing to the eye	84,21	87,50	0,81
The font size was readable and acceptable	89,47	93,75	0,82
The graphics were effective and clarified the content	78,95	87,69	0,52
The navigational indicators was clear and consistent	89,47	76,92	0,37
I enjoyed working with the website	89,47	85,71	0,73
The website was easy to use	70,59	73,44	0,65
The online format made the exercises more interesting than the equivalent pen-and-paper format	78,95	81,25	0,81
I would make use of the website when studying	84,21	93,75	0,37
The website will assist me to improve the quality of my work	63,16	83,08	0,13
I will never use e-mail to communicate with a lecturer and fellow learners	38,89	41,27	0,47
I would prefer to have their study material made available online	27,78	36,51	0,73
I would prefer to receive instruction through a combination of media and technology	55,56	57,38	0,80

With reference to Table 4.7, the independent variables (age groups) indicate a significant difference in the rating of the statement: Learners' view on their computer literacy.

Table 4.8 and Figure 4.27 on the next page show the results in percentage responses of the p-value <0,05 as indicated in Table 4.7 as a significant difference. These results indicate a significant difference only in percentage responses in the categories age group equal and younger than 29 years and age group equal an older than 30 and learners' view on their computer literacy.

Table 4.8: Percentage responses for categories age groups (≤29 years and younger and ≥30 years and older) and learners' views on their computer literacy

Statement: Learners view themselves computer literate/illiterate						
Response	Age group: ≤ 29 yr		Age group: ≥ 30 yr		Row Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Computer literate	14	73,68	29	46,77	43	53,09
Computer illiterate	5	26,32	33	53,23	38	46,91
Col total	19	100	62	100	81	100
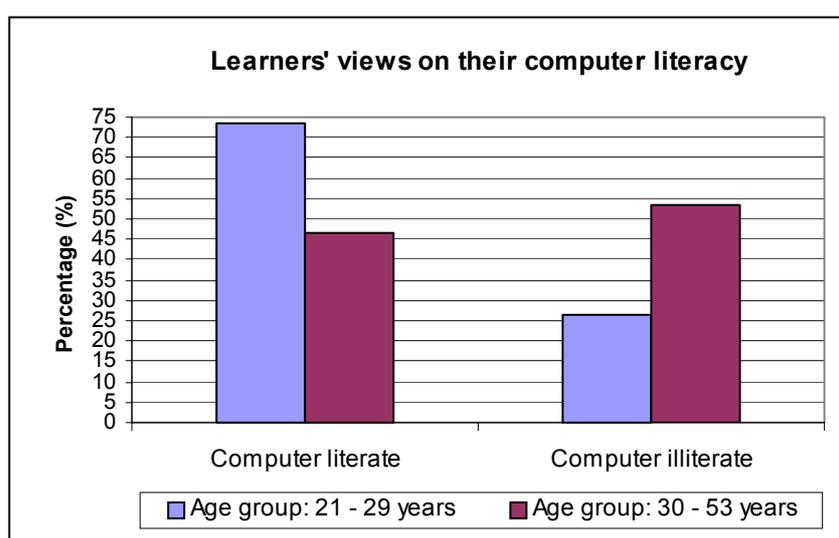
Figure 4.27: Percentage responses for categories age groups (≤29 years and younger and ≥30 years and older) and learners' views on their computer literacy

Table 4.8 and Figure 4.27 illustrate the responses (expressed in percentages) of the categories age group equal and younger than 29 years and age group equal an older than 30 years and their views on their computer literacy. With reference to Table 4.8 and Figure 4.27, a significantly larger percentage of learners in the younger age group view themselves as computer literate (73,68 per cent) than in the older age group (46,77 per cent). The results indicate that the majority of learners (76,54 per cent) who enrol for the Social Behavioural Studies in HIV and AIDS Honours Programme fall in the age group 30 years and older. It may be assumed that this trend will continue in future since this is a postgraduate qualification and learners often stop studying for a period of years after graduating before commencing with postgraduate studies.

Since a large number of learners in the older age group indicated that they are computer illiterate (53,23 per cent), this factor should be taken into consideration when planning and designing computer-based and Internet-based study material. E-learning websites should be kept simple and easy to use, and should be planned in such a way that they will accommodate older adult learners with limited computer literacy skills. However, these learners should also be encouraged to improve their computer and Internet skills. Computer illiterate learners are advised to take an introductory computer course for non-degree purposes offered by the department of Computer Science at VISTA University. Computer and Internet literacy are increasingly viewed as indispensable skills, and it is often merely *assumed* that people *do* possess these skills (the contrary often being regarded as unthinkable).

The responses from the two sub-groups (age groups) did not differ significantly in their rating of the other variables. These results contradicted what I expected to find. I expected the older learners to have difficulty with the unfamiliar format of the website and its use because computers – and especially the Internet – were not so widely used when they were undergraduates. However, this sample of learners shows that there was no significant difference between younger and older learners and how they experienced the website.

❑　**Sex**

The next section illustrates the results from the Chi-square test. It analyses the responses for significant differences between male and female learners with regard to the variables listed on the next page in Table 4.9. The percentages for each group are given as well as the p-values. The p-values indicated as bold type phase in Table 4.9 are the responses that tested a significant difference of a value <0,05.

Table 4.9: Chi-square test results for significant differences between the responses of male and female learners with regard to the listed variables.

Variables	Sex		p-value
	Male (%) (n=31)	Female (%) (n=76)	
I have access to a computer for my studies	37,93	36,11	0,86
I view myself as computer literate	44,83	49,30	0,68
I have access to the Internet	41,38	45,83	0,68
The screen layout was good and easy to read	86,67	94.52	0,28
The font appearance was pleasing to the eye	93,33	85,14	0,27
The font size was readable and acceptable	93,33	93,24	0,97
The graphics were effective and clarified the content	86,67	85,33	0,51
The navigational indicators was clear and consistent	76,67	80,00	0,19
I enjoyed working with the website	89,66	83,78	0,10
The website was easy to use	68,97	72,60	0.15
The online format made the exercises more interesting than the equivalent pen-and-paper format	82,76	82,43	0,99
I would make more use of the website when studying	96,67	90,41	0,41
The website will assist me to improve the quality of my work	86.67	77,33	0,55
I will never use e-mail to communicate with a lecturer and fellow learners	39,29	42,25	0,43
I would prefer to have their study material made available online	28,57	40,28	**0,009**
I would prefer to receive instruction through a combination of media and technology	73,08	48,57	**0,04**

With reference to Table 4.9, the independent variable (sex), indicates a significant difference in the rating of the two following questions as stated in the questionnaire:

- Would you prefer to have your study material made available online?
- Would you prefer to receive instruction through a combination of media and technology?

The responses from the two sub-groups did not differ significantly in respect of the rating of the other variables.

Table 4.10 below and Figure 4.28 on the next page show the results and indicate a significant difference in percentage responses by sex category to the question: Would you prefer to have your study material made available online?

The options put to the learners were:

- Yes
- It does not matter
- No, I prefer a printed format
- It would be handy to have the study material in both printed format and on the Internet
- It is unnecessary to have study material in both printed format and on the Internet

Table 4.10: Percentage responses for the sex categories and the question concerning availability of study material online

Question: Would you prefer to have your study material made available online?						
Response	**Male**		**Female**		**Row Total**	
	Frequency	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Yes	8	28,57	29	40,28	37	37,00
Does not matter	0	0,00	2	2,78	2	2,00
No, prefer printed format	12	42,86	10	13,89	22	22,00
Yes, both formats	7	25,00	31	43,06	38	38,00
No, not both formats	1	3,57	0	0,00	1	1,00
Col total	28	100	72	100	100	100
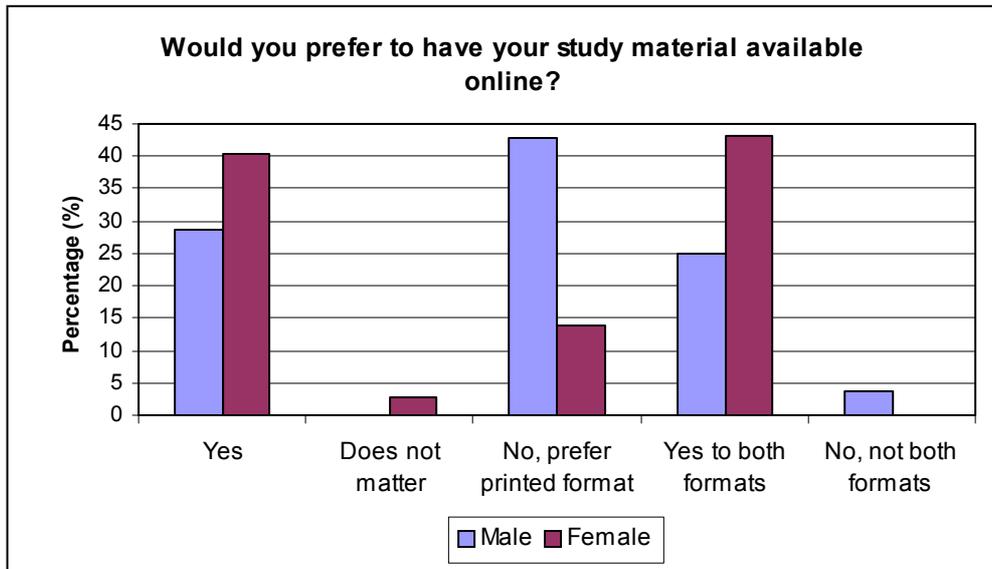
Figure 4.28: Percentage responses for the sex categories and the question concerning mode of presenting the study material

Table 4.10 and Figure 4.28 illustrate the responses (expressed in percentages) of male and female learners to the question about online study material. With reference to Table 4.10 and Figure 4.28, a larger percentage of female learners (40,28 per cent) would prefer online study material than male learners (28,57 per cent). There are also more female learners (43,06 per cent) who would prefer to have the study material available in both printed format and on the Internet than male learners (25,00 per cent). For this sample of learners, the results contradict what I expected. A perception exists that females are *less* inclined to use "new" technologies. However, in this case, it is the female learners who are more willing to use the new format of learning than are the male learners.

Table 4.11 and Figure 4.29 on the next page represent the results, and indicate a significant difference in percentages of the responses by sex category to the question: Would you prefer to receive instruction through a combination of media and technology?

Table 4.11: Percentage responses for the sex categories and the question concerning instruction through a combination of media and technology

Question: Would you prefer to receive instruction through a combination of media and technology?						
Response	Male		Female		Row Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
No	3	11,54	6	8,57	9	9,38
Maybe	4	15,38	30	42,86	34	35,42
Absolutely	19	73,08	34	48,57	53	55,21
Col total	26	100	70	100	96	100
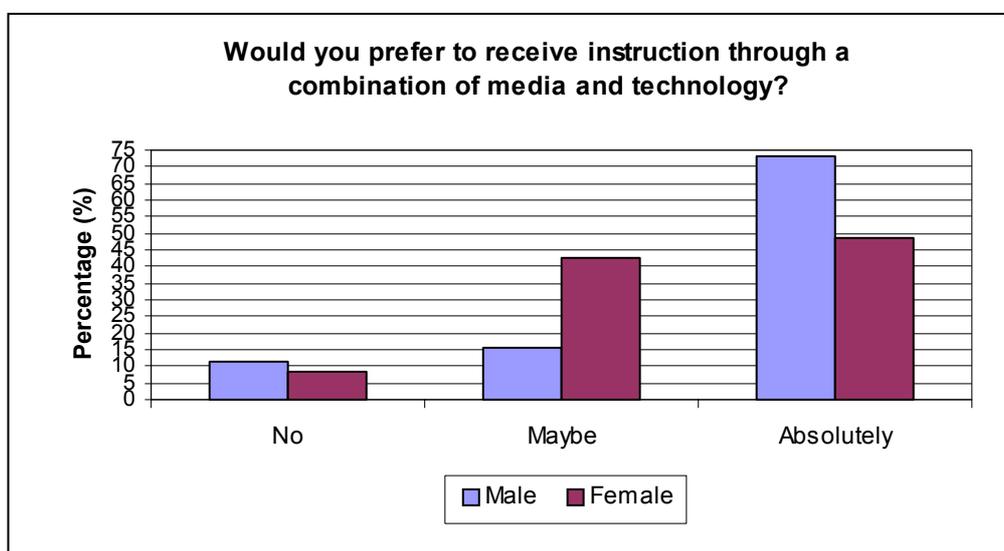
Figure 4.29: Percentage responses in the sex categories to the question concerning instruction through a combination of media and technology

Table 4.11 and Figure 4.29 illustrate the responses (expressed in percentages) of male and female learners to the question regarding receiving instruction through a combination of media and technology. Table 4.11 and Figure 4.29 show that a larger percentage of male learners (73,08 per cent) would prefer instruction through a combination of media and technology than female learners (48,57 per cent). A large percentage of female learners (42,86 per cent) were unsure and indicated a *maybe* to the question. The result may indicate that the female learners were unsure or did not know what was meant by the statement a *combination of media and technology*. The female learners might also have had less exposure to media and technology other than to printed formats – and this may account for their uncertainty and their lower positive rating on the question. The female learners might also have had little experience of modes such as video-conferencing.

❑ **Computer access**

The next section illustrates the results from the Chi-square test, and analyses the responses for significant differences between learners with access to a computer for their studies and those without access, with reference to the variables listed in Table 4.12. The p-values indicated as bold type phase in Table 4.12 are the responses that tested a significant difference of a value <0,05.

Table 4.12: Chi-square test results for significant differences between learners with access to a computer for their studies and those without access, with regard to the listed variables

Variables	Computer access (%) (n=38)	No computer access (%) (n=64)	p-value
I have access to the Internet	81,58	22,22	**0,0001**
The screen layout was good and easy to read	94,74	90,32	0,68
The font appearance was pleasing to the eye	86,84	87,30	0,32
The font size was readable and acceptable	94,74	92,06	0,17
The graphics were effective and clarified the content	89,47	84,38	0,24
The navigational indicators was clear and consistent	89,47	71,88	0,89
I enjoyed working with the website	83,78	85,71	0,27
The website was easy to use	91,89	59,68	**0,003**
The online format made the exercises more interesting than the equivalent pen-and-paper format	81,08	80,95	0,14
I would make use of the website when studying	97,37	88,71	0,23
The website will assist me in improving the quality of my work	73,68	81,25	0,66
I would prefer to have their study material made available online	44,74	33,33	0,20
I would prefer to receive instruction through a combination of media and technology	78,95	37,50	**0,0003**

With reference to Table 4.12, the independent variables (computer access and no computer access) indicate a significant difference in the respective rating of the statements:

- I have access to the Internet
- The website was easy to use
- I would prefer to receive instruction through a combination of media and technology

The responses from the two sub-groups did not differ significantly in respect to the rating of the other variables.

Table 4.13 and Figure 4.30 below represent the results and indicate a significant difference in percentage responses in the categories computer access and no computer access to the statement: I have access to the Internet.

Table 4.13: Percentage responses in the categories computer access and no computer access and the statement: I have access to the Internet

Statement: I have access to the Internet						
Response	Computer access		No computer access		Row Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Yes	31	81,58	14	22,22	45	44,55
No	7	18,42	49	77,78	56	55,45
Col total	38	100	63	100	101	100
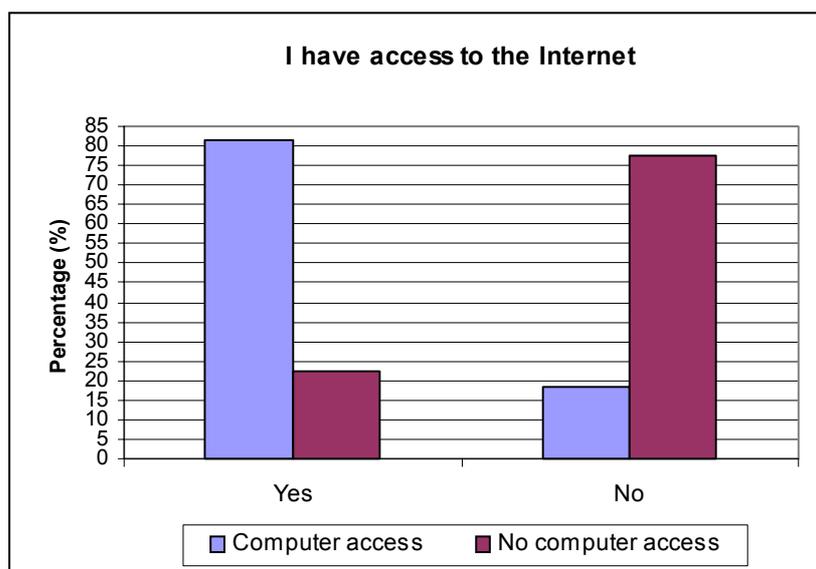
Figure 4.30: Percentage responses for categories computer access and no computer access and the statement: I have access to the Internet.

Table 4.13 and Figure 4.30 illustrate the percentage responses for the categories computer access and no computer access and the statement: I have access to the Internet. Table 4.13 and Figure 4.30 show that the majority of learners with access to computers for their studies *also* had access to the Internet (81,58 per cent), while 18,42 per cent of learners with access to computers did *not* have access to the Internet. It is encouraging to note that there are a number of learners that access the Internet although they do not have access to computers for their studies (22,22 per cent). These learners indicated that they accessed the Internet mainly from work, from a friend's computer, or in an Internet café. A large number of learners that did not have access to computers for their studies also indicated that they do not have Internet access (77,78 per cent). These learners should be

made aware that ways do exist to access the Internet even if they do not possess their own computers.

The results in Table 4.14 and Figure 4.31 below show that there are significant differences in responses in the categories computer access and no computer access to the statement: The website was easy to use.

Table 4.14: Percentage responses in categories computer access and no computer access to the statement: The website was easy to use.

Statement: The website was easy to use						
Response	Computer access		No computer access		Row Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Agree	34	91,89	37	59,68	71	71,72
Neutral	2	5,41	14	22,58	16	16,16
Disagree	1	2,70	11	17,74	12	12,12
Col total	37	100	62	100	99	100
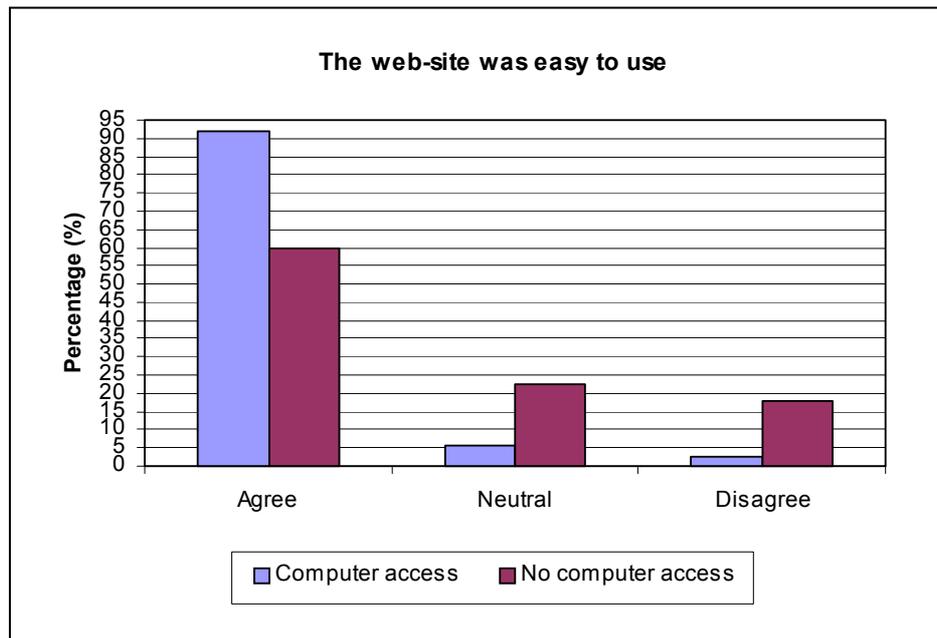
Figure 4.31: Percentage responses in the categories computer access and no computer access to the statement: The website was easy to use.

Table 4.14 and Figure 4.31 illustrate the responses (expressed in percentages) of learners with or without computer access to the statement regarding ease of use of the website. Table 4.14 and Figure 4.31 show that the majority of learners with access to computers for their studies agreed that the website was easy to use (91,89 per cent), while a smaller number of learners without computer

access agreed with the statement (59,68 per cent). A relatively large number of learners without access to computers rated the statement as neutral (22,58 per cent). These results are not surprising because one might expect that learners without access to computers would find it more difficult to use the website or would find it difficult to evaluate whether or not it is easy to use the website.

Table 4.15 and Figure 4.32 below show a significant difference in percentage responses in the categories computer access and no computer access to the statement: I would prefer to receive instruction through a combination of media and technology.

Table 4.15: Percentage responses in the categories computer access and no computer access to the statement concerning instruction through a combination of media and technology

Question: I would prefer to receive instruction through a combination of media and technology.						
Response	**Computer access**		**No computer access**		**Row Total**	
	Frequency	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Absolutely	30	78,95	21	37,50	51	54,26
Maybe	7	18,42	27	48,21	34	36,17
No	1	2,63	8	14,29	9	9,57
Col total	38	100	56	100	94	100
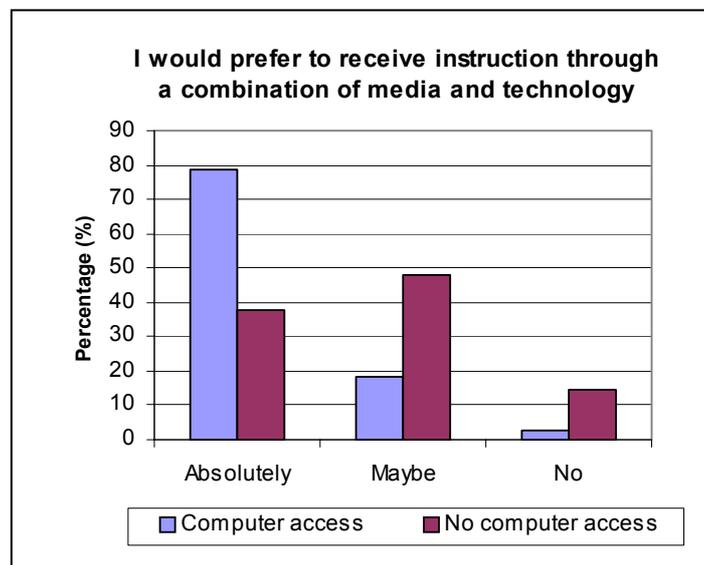
Figure 4.32: Percentage responses in the categories computer access and no computer access to the question concerning instruction through a combination of media and technology.

Table 4.15 and Figure 4.32 illustrate the responses (expressed in percentages) of learners with or without computer access to the question about receiving instruction through a combination of media

and technology. Table 4.15 and Figure 4.32 show that the majority of learners with access to a computer would prefer to receive instruction through a combination of media and technology (78,95 per cent) while a smaller number of learners without computer access responded positively (37,50 per cent). A large number of learners without access to computers rated the statement as neutral (48,21 per cent). As in the previous case, such results are not unexpected. It is probable that learners without access to computers assumed that receiving instruction through means other than a paper-based mode would infer that the "other means" refer to computers and the Internet. Such learners could also not be expected to be aware that there are modes of instruction other than those that involve computers and the Internet.

❑　**Computer literacy**

The next section shows the results obtained from applying the Chi-square test, and from analysing the responses for significant differences between learners who are computer literate and those who are computer illiterate, with reference to the variables listed in Table 4.16. The p-values indicated as bold type phase in Table 4.16 are the responses that tested a significant difference of a value <0,05.

Table 4.16: Chi-square test results for significant differences between learners with access to a computer for their studies and without access, with regard to the listed variables

Variables	Computer literate (%) (n= 49)	Computer illiterate (%) (n= 52)	p-value
I have access to a computer for my studies	66,67	11,54	**0,0001**
I have access to the Internet	71,43	21,15	**0,0001**
The screen layout was good and easy to read	93,88	90,00	0,34
The font appearance was pleasing to the eye	87,76	86,27	0,14
The font size was readable and acceptable	91,67	94,23	0,12
The graphics were effective and clarified the content	85,71	86,54	0,80
The navigational indicators was clear and consistent	85,71	73,08	0,13
I enjoyed working with the website	89,58	84,31	0,36
The website was easy to use	85,11	60,78	**0,009**
The online format made the exercises more interesting than the equivalent pen-and-paper format	81,25	82,35	0.63
I would make use of the website when studying	95,92	88,00	0,12
The website will help me to improve the quality of my work	75,51	80,77	0,80
I will never use e-mail to communicate with a lecturer and fellow learners	37,50	45,83	0,30
I would prefer to have the study material available online	45,83	30,61	0,07
I would prefer to receive instruction through a combination of media and technology	68,75	42,22	**0,03**

In Table 4.16, the independent variables (computer literate and computer illiterate) indicate a significant difference in the respective rating of the statements:

- I have access to a computer for my studies
- I have access to the Internet
- The website was easy to use
- I would prefer to receive instruction through a combination of media and technology

The responses from the two sub-groups did not differ significantly in respect of how the other variables were rated.

The results tabulated in Table 4.17 and Figure 4.33 on the next page show that was a significant difference in responses in the categories computer literate and computer illiterate to the statement: I have access to a computer for my studies.

Table 4.17: Percentage responses in the categories computer literate and computer illiterate to the statement concerning learners that have access to a computer for their studies

Statement: I have access to a computer for my studies						
Response	Computer literate		Computer illiterate		Row Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Yes	32	66,67	6	11,54	38	38,00
No	16	33,33	46	88,46	62	62,00
Col total	48	100	52	100	100	100
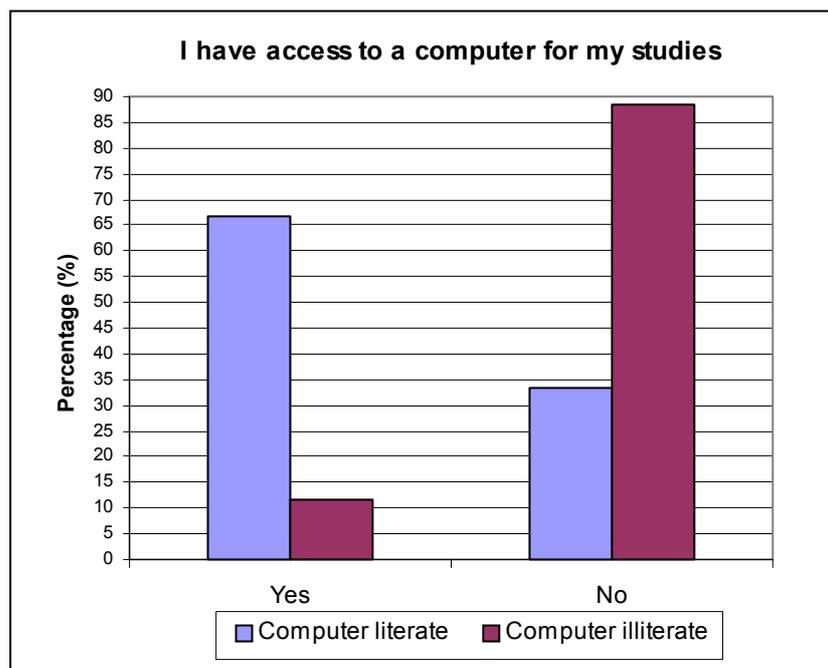
Figure 4.33: Percentage responses in the categories computer literate and computer illiterate to the statement: I have access to a computer for my studies.

Table 4.17 and Figure 4.33 illustrate the responses (expressed in percentages) of learners that are computer literate and computer illiterate to the statement about having access to computers for their studies. Table 4.17 and Figure 4.33 show that the majority of learners who view themselves as computer literate also have access to computers (66,67 per cent). It is notable that there are a small number of learners who view themselves as computer *illiterate* although they have access to computers (11,54 per cent). As might be expected, a large number of learners that do not have access to computers are computer illiterate (88,46 per cent). Such learners should be urged to become computer literate since computer literacy is an indispensable skill, especially for postgraduate learners. However, there are a number of learners who view themselves as computer literate even though they do not have access to computers (33,33 per cent). Learners should be encouraged and supported to use and improve their computer skills. The University should accommodate such learners by providing them access to computers on campus and at the tutor centres.

Table 4.18 below and Figure 4.34 on the next page indicate a significant difference in percentage responses in terms of the categories computer literate and computer illiterate to the statement: I have access to the Internet.

Table 4.18: Percentage responses in the categories computer literate and computer illiterate to the statement: I have access to the Internet

Statement: I have access to the Internet						
Response	Computer literate		Computer illiterate		Row Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Yes	35	71,43	11	21,15	46	45,54
No	14	28,57	41	78,85	55	54,46
Col total	49	100	52	100	101	100
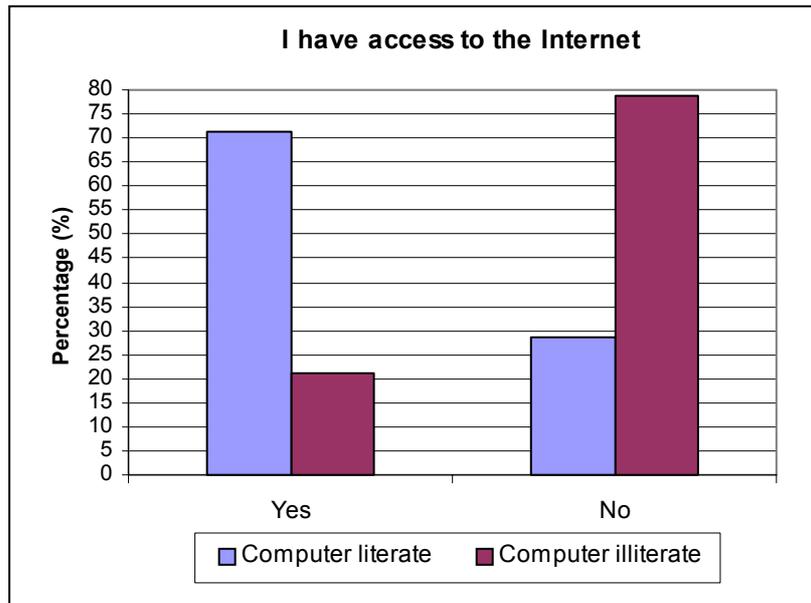
Figure 4.34: Percentage responses in the categories computer literate and computer illiterate to the statement: I have access to the Internet.

Table 4.18 and Figure 4.34 illustrate the responses (expressed in percentages) of learners that are computer literate and computer illiterate to the statement in which they say that they have access to the Internet or not. Table 4.18 and Figure 4.34 show that the majority of learners that view themselves as computer literate have access to the Internet (71,43 per cent), although there are a number of computer literate learners that do not have Internet access (28,57 per cent). As expected, a large number of computer illiterate learners do not have access to the Internet (78,85 per cent), although some of these learners do have access (21,15 per cent). Learners should be made aware of where they can access the Internet − especially in the case of university learners for whom the university makes such facilities available.

Table 4.19 and Figure 4.35 on the next page show that there is a significant difference in percentage responses in the categories computer literate and computer illiterate to the statement: The website was easy to use.

Table 4.19: Percentage responses for the categories computer literate and computer illiterate to the statement: The website was easy to use

Statement: The website was easy to use						
Response	Computer literate		Computer illiterate		Row Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Agree	40	85,11	31	60,78	71	72,45
Neutral	6	12,77	10	19,61	16	16,33
Disagree	1	2,13	10	19,61	11	11,22
Col total	47	100	51	100	98	100
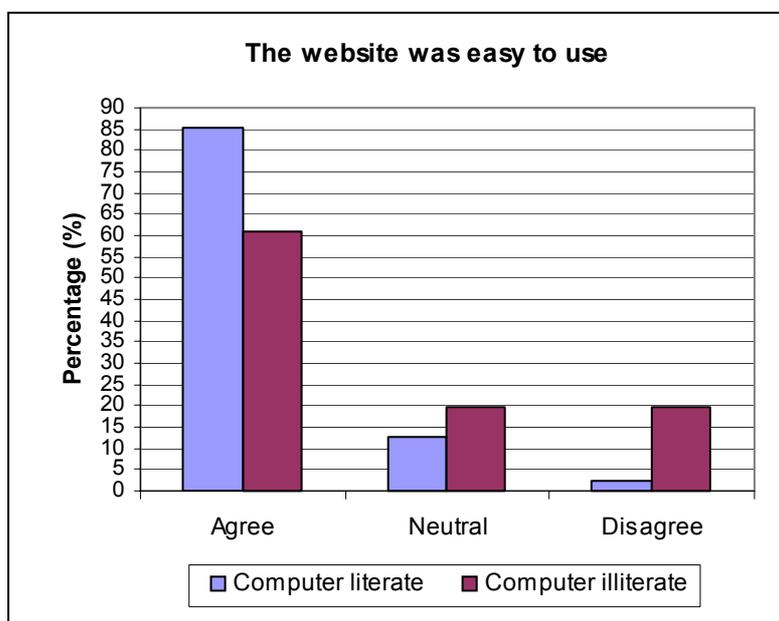
Figure 4.35: Percentage responses in the categories computer literate and computer illiterate to the statement: The website was easy to use

Table 4.19 and Figure 4.35 illustrate the responses (expressed in percentages) of learners that are computer literate and computer illiterate to the statement: The website was easy to use. Table 4.19 and Figure 4.35 show that the majority of learners that view themselves as computer literate agreed that the website was easy to use (85,11 per cent), while a small number (2,23 per cent) disagreed with the statement. Of the computer illiterate learners, 60,78 per cent agreed that the website was easy to use while 19,61 per cent disagreed with the statement. It is not surprising that the computer illiterate learners did not feel that the website was easy to use since they most probably did not have any previous exposure to the Internet – and even less to a learning website. These learners should be encouraged to acquire some basic computer and Internet skills.

Table 4.20 and Figure 4.36 show a significant difference in percentage responses in the categories computer literate and computer illiterate to the statement: I would prefer to receive instruction through a combination of media and technology.

Table 4.20: Percentage responses in the categories computer literate and computer illiterate to the statement: I would prefer to receive instruction through a combination of media and technology

Statement: I would prefer to receive instruction through a combination of media and technology						
Response	Computer literate		Computer illiterate		Row Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Absolutely	33	68,75	19	42,22	52	55,91
Maybe	11	22,92	21	46,67	32	34,41
No	4	8,33	5	11,11	9	9,68
Col total	48	100	45	100	93	100
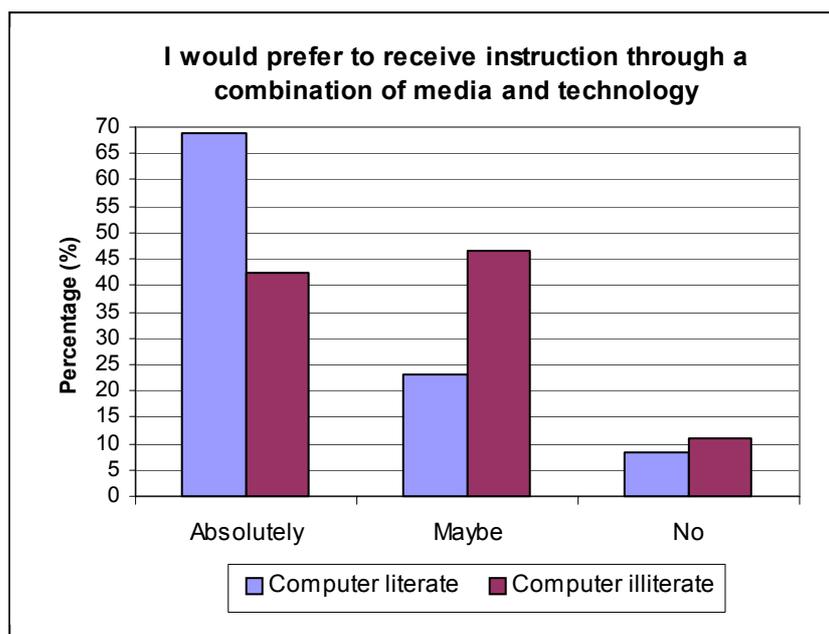
Figure 4.36: Percentage responses in the categories computer literate and computer illiterate to the question: I would prefer to receive instruction through a combination of media and technology.

Table 4.20 and Figure 4.36 illustrate the responses (expressed in percentages) of learners that are computer literate and computer illiterate to the statement: I would prefer to receive instruction through a combination of media and technology. Table 4.20 and Figure 4.36 show that 68,75 per cent of the learners that view themselves as computer literate indicated that they would prefer to receive instruction through a combination of media and technology – compared to 42,22 per cent of

computer illiterate learners. Although a combination of media and technology encompasses more than computer technology alone, the smaller number of computer illiterate learners that would prefer to receive instruction through a combination of media and technology was expected since a great deal of education nowadays involves the use of computers and the Internet. A large number of learners in both categories are undecided. This may indicate a degree of learner inexperience when confronted by media and technology other than printed and computer formats.

The next section illustrates the results from the Chi-square test that analysed the responses to find significant differences between learners with access to the Internet and without Internet access, with reference to the variables listed in Table 4.21. The p-values indicated as bold type phase in Table 4.21 are the responses that tested a significant difference of a value <0,05.

Table 4.21: Chi-square test results for significant differences between learners with access to the Internet and those without Internet access, with regard to the listed variables

Variables	Internet access (%) (n=46)	No Internet access (%) (n=56)	p-value
The screen layout was good and easy to read	95,56	89,09	0,46
The font appearance was pleasing on the eye	84,78	89,09	0,31
The font size was readable and acceptable	95,56	91,07	0,15
The graphics were effective and clarified the content	89,13	83,93	0,36
The navigational indicators was clear and consistent	82,61	76,79	0,73
I enjoyed working with the website	82,61	88,89	0,65
The website was easy to use	91,11	57,41	**0,0008**
The online format made the exercises more interesting than the equivalent pen-and-paper format	80,43	83,33	0,59
I would make use of the website when studying	95,65	88,89	0,46
The website will help me to improve the quality of my work	76,09	80,36	0,34
I will never use e-mail to communicate with a lecturer and fellow learners	28,89	51,92	**0,01**
I would prefer to have their study material made available online	45,65	30,77	0,27
I would prefer to receive instruction through a combination of media and technology	67,39	43,75	0,05

Table 4.21 shows that the independent variables (Internet access and no Internet access) indicate a significant difference in the rating of the following statement and question:

- The website was easy to use
- Will you use e-mail to communicate with lecturers and fellow learners?

The responses from the two sub-groups did not differ significantly in respect of the rating of the other variables.

Table 4.22 and Figure 4.37 show significant percentage differences in the responses in the categories Internet access and no Internet access to the statement: The website was easy to use.

Table 4.22: Percentage responses in the categories Internet access and no Internet access to the statement: The website was easy to use

Statement: The website was easy to use						
Response	Internet access		No Internet access		Row Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Agree	41	91,12	31	57,40	72	72,73
Neutral	2	4,44	14	25,93	16	16,16
Disagree	2	4,44	9	16,67	11	11,11
Col total	45	100	54	100	99	100
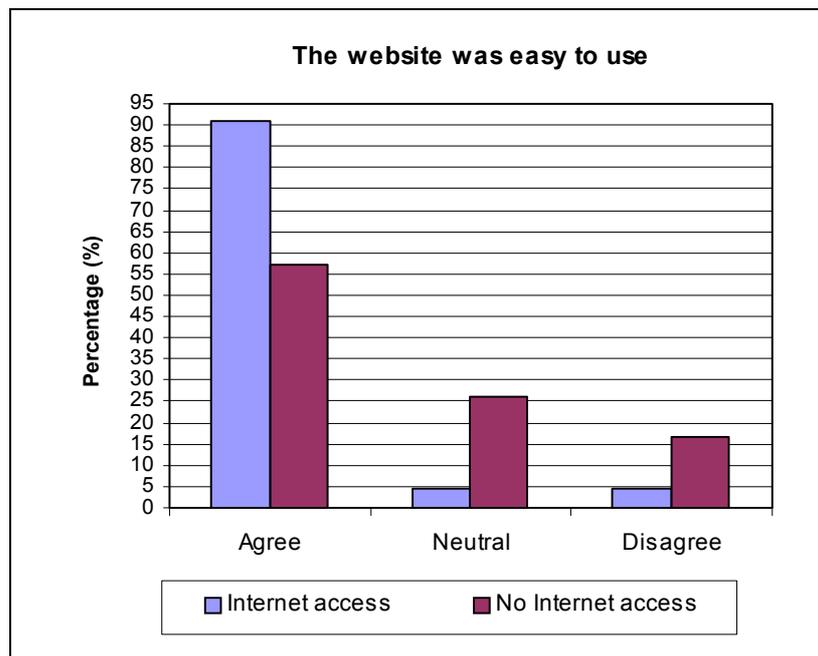
Figure 4.37: Percentage responses in the categories Internet access and no Internet access to the statement: The website was easy to use.

Table 4.22 and Figure 4.37 illustrate the responses (expressed in percentages) of learners with and without Internet access to the statement regarding ease of use of the website. Table 4.22 and Figure 4.37 show that the majority of learners with access to the Internet agreed (91,12 per cent) that the website was easy to use while a smaller number of learners without Internet access agreed with the

statement (57,40 per cent). A relatively large number of learners without Internet access rated the statement as neutral (25,93 per cent). I expected that some of the learners who did not have Internet access would find it more difficult to master the website or would have difficulty in evaluating the level of ease of use of such a website. These learners had no or very little exposure to the Internet and therefore are most probably not familiar with the use of the Internet. They also did not have any exposure to other e-learning websites so that they could compare the website under evaluation with other e-learning websites.

Table 4.23 and Figure 4.38 on the next page indicate a significant percentage difference in of the responses in the categories Internet access and no Internet access to the statement: I will never use e-mail to communicate with lecturers and fellow learners.

Table 4.23: Percentage responses in categories Internet access and no Internet access to the question: Will you use e-mail to communicate with lecturers and fellow learners?

Question: Will you use e-mail to communicate with lecturers and fellow learners?						
Response	Internet access		No Internet access		Row Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Never	13	28,89	27	51,92	40	41,24
Sometimes	22	48,89	22	42,31	44	45,36
Often	10	22,22	3	5,77	13	13,40
Col total	45	100	52	100	97	100
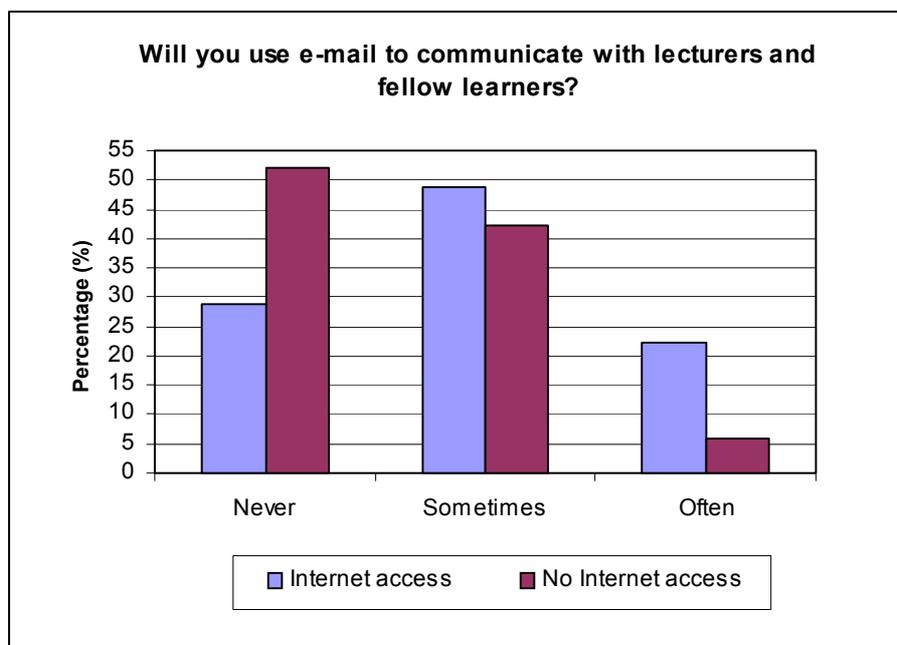
Figure 4.38: Percentage responses in categories Internet access and no Internet access to the question: Will you use e-mail to communicate with lecturers and fellow learners?

Table 4.23 and Figure 4.38 illustrate the responses (expressed in percentages) of learners to the question about whether or not they will use e-mail to communicate with lecturers and fellow learners. Table 4.23 and Figure 4.38 show that only a small number of learners with Internet access (22,22 per cent) indicated that they would use e-mail to communicate with lecturers and fellow learners *often*. The majority of learners with Internet access (48,89 per cent) as well as those without Internet access (42,31 per cent) indicted that they would use e-mail to communicate with lecturers and fellow learners only *sometimes*. Some learners, although they have Internet access, indicted that they would *never* use e-mail as a means of communication (28,89 per cent). These results are an indication of the small number of learners who have adapted to using e-mail as a cheap and easy form of communication. Although learners have e-mail access, the concept is still unfamiliar to them and they have not yet made the mind shift that will enable them to use e-mail rather than another means of communication. Some learners may also still prefer the more personal touch of speaking directly to their lecturers or fellow learners.

❑ Summary

This chapter reported on the results from the evaluation of a website as part of an e-learning distance education course developed for learners studying nutrition and HIV and AIDS. The goal of this chapter was to report on the usability and instructional effectiveness of a website as part of a distance education course employing a combination of media and technology.

One of the main problems encountered when it comes to teaching learners by means of distance education in nutrition and HIV and AIDS is their lack of background knowledge about the subject matter. This is caused by the learners' divers educational backgrounds as well as by their varied levels of background knowledge. The website was developed to serve as a tool to help these adult learners to acquire additional information and background knowledge in a more stimulating and interactive manner.

The website was evaluated at various stages by means interviews and discussions, focus groups, observations, expert reviews, think-aloud procedures, and questionnaires. Data was analysed quantitatively and qualitatively to ascertain how the website addressed the issues stated in the main research question and in the sub-questions. Empirical statistics based on the questionnaires were reported with the aid of tables and charts. A search for significant differences between various sub-groups and their responses to certain statements and questions from the questionnaires was conducted. The purpose of this was to find additional answers to the research questions or (in some cases) to substantiate the previous findings.

It was noted that a large percentage of learners in the age group older than 30 years of age did not regard themselves as computer literate. Factors such as learners' age and their level of computer literacy need to be considered when planning and developing e-learning supported courses.

Interestingly, there was no significant relationship between the computer literacy of males and females. This finding is contradictory to the perception that females in general are less inclined to show interest in and use of computers and related technology.

Although the learners had no or little previous exposure to e-learning, they had little trouble adjusting to this *new* mode of delivery and found it easy to operate the website. The results indicated that the learners responded positively towards the website and appreciated its value in assisting them to gain new knowledge and information. These results were unexpected since it was thought that this *new* mode of offering distance education material would be difficult for learners to adjust to, and that they would show more resistance to using it.

The learners indicated that the quizzes on nutrition were stimulating and that the immediate feedback helped them to ascertain what progress they had made. They also enjoyed working with the website. Learners found it easy to access information through the site and they indicated that the site provided them with means to access information which they would otherwise not have been able to access. The majority of learners felt that the website would help them to understand the subject content better and to improve the quality of work that they submitted for assessment.

The majority of learners indicated that they preferred to receive their study material in a printed format. Learner preferences such as these as well as other constraints or preferences need to be considered in the planning and development of a distance education course. Thus, for example, the course could be planned to accommodate learners who are totally dependent on printed materials while it might at the same time be designed to use media and technology to support and enhance the paper format for those others who are not totally dependent on the printed format. Learners should also be encouraged to widen their horizons and explore other avenues of media and technology for information – especially since they are studying at a postgraduate level.

I recommend that the following suggestions be implemented in website design in such circumstances because their viability has been ascertained by her research into the questions that were investigated in this chapter. These suggestions are summarised in Table 4.24 on the next page.

Table 4.24: A summary of the suggestions indicated by the research questions and the research

No	Question	Attribute	Suggestions
2	How can e-learning and the Internet be implemented in such a way so as to add value to a distance education course in nutrition and HIV and AIDS?	New development	• Increase courses • Provide current information and knowledge • Provide inexpensive communication facilities
4	What interface design principles would best facilitate the communication of nutrition knowledge to learners in the field of HIV and AIDS?	Appropriateness of applied interface design principles as experienced by learners	• User-centred design: consideration of learner profiles during design and development • Involving learners during design/development phases • Maintaining simplicity and consistency • Legibility
5	To what extent does the learning website conform to general web usability principles?	Usability as experienced by learners	• They had little difficulty in learning to execute basic tasks • They were able to use the site efficiently • They made good progress • They enjoyed their experiences on the website. • They enhanced their skills
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 learners in the field of nutrition and HIV and AIDS?	Media preferences of learners Advantages and limitations as experienced by learners	Computer and Internet technology, video conferencing, group and individual contact sessions Advantages • Motivation • Access to current information • Interactivity • Increased confidence • Enjoyment • Challenging Limitations • The need to learn to use the technology effectively before they can focus on content • They have difficulty in accessing facilities or have no access at all • Access costs escalate • They need good infrastructure and support • They are unaware of available facilities (e.g. access to Internet from the University library, electronic journals, etc.) • They prefer on the whole not to use available features (such as e-mail communication). They need to change these attitudes
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?	New development	• Media and technology should form an integral part of the distance education course and learners should utilise all available recourses.

It is concluded that the website has a high level of usability, that it is instructionally effective and stimulating, and that it can form a vital component in a combination of media and technology for distance education learners.

In chapter 5 I present the conclusions and recommendations that arise from the reported research, and I relate these conclusions and recommendations to the research questions.

CHAPTER 5

Conclusions and recommendations

5.1   Introduction

The motivation for this study, as outlined in chapter 1, section 1.3, is based on (1) what needs to be done to 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) 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 then formulated the following research problem to reflect the motivation:

What factors and constraints need to be considered when designing, developing and implementing a distance education course comprising a combination of media and technologies for the effective teaching of nutrition and HIV and AIDS at a South African distance education university?

The research problem was then narrowed down to eight sub-questions in order to establish possible solutions. The study addressed each sub-question by means of an analysis of the published literature, by analysing how the findings of the project shed light on each research sub-question, and how each sub-question illuminated (in a wider sense) the remaining sub-questions, and the research question in general. The answers to the research sub-questions permitted the me to determine how the teaching of learners in the field of nutrition and HIV and AIDS could be made more effective by utilizing a distance education course that comprises a combination of media and technologies.

Chapter 2 comprises an analysis of the reported research relevant to each specific sub-question of the main research question. Chapter 3 answered sub-questions 2, 3, 4, 5, 7 and 8 by reporting on case studies drawn from learner involvement with the learning website. Chapter 4 drew together all the results from the statistical analysis in order to answer the research questions. Chapter 5 closes with concluding remarks about the study and recommendations for further research and development.

5.2   Findings and results collected from the research

What follows is a discussion and analysis of the data that I obtained from the research that I reported in chapters 2, 3 and 4. I answered each research question by analysing the data obtained from the literature study, questionnaires, observations, learner interviews, discussions, and the evaluation of the learning website.

5.2.1   Pressures on distance higher education

Research Question 1
What pressures are put on South African distance higher education institutions to provide postgraduate flexible learning to adult learners from previously disadvantaged communities?

The South African education system is currently challenged by an increasing demand for education. Higher education institutions need to provide alternative means of offering education by incorporating distance education and e-learning to increase access and meet adult learners learning needs within the framework of life-long learning (Charp, 2003:8; Bose, 2003:[Online]; Grooms, 2003:[Online]; Abouchedid & Eid, 2004:15; Ally, 2004:5; Zentel et al, 2004:237). There are researchers that are of the view that distance education and e-learning may be a more appropriate way of delivering education to groups of learners who come from different ethnic backgrounds, and whose needs and expectations, prior education and life experience, personal learning styles and abilities vary considerably (Mutula, 2002:99; Beller & Or, 2003:24). The results of this study as reported in chapters 3 and 4 on the learner profile indicate that the learners enrolled for the Social Behavioural Studies in HIV and AIDS Honours Programme fit this profile and that delivering their educational needs by means of distance education and e-learning will be more appropriate.

The most important role-players in the demand for more flexible and effective education are the learners themselves (Anon, 2001:[Online]). When the nutrition and HIV and AIDS course was designed and developed the needs and requirements of the adult learners mostly from previous disadvantaged communities were viewed as very important. The research results indicated that most of the learners conform to a distinctive profile with specific training needs and requirements. The adult learner profile, as reported in this research, coincides well that derived from the analysis of the literature.

Table 5.1 on the next page summarises the adult learner profile, and shows age, work status, gender, and personal circumstances reported (1) by the literature in chapter 2 and (2) by the results of this research in chapters 3 and 4.

Table 5.1: An integrated summary of the adult learner profile as reported by the literature and the results of this research

Classification	Literature analysis	Reported research
Age	Adults, older than 25 years	The majority of learners are older than 25 years (91,1%).
Work status	Working full time or part time	The majority of learners are working (78,8%).
Gender	A large number are female.	Most of the learners are female (71,75%).
Personal circumstances	Family commitments, women with children, single parents, financial constraints	Many learners indicated that they have family commitments, are women with children, are single parents, and that they have limited financial resources.

This table shows that the most of the learners are older, working adults. They are mainly females with children and family commitments, and have limited financial resources.

The needs and requirements identified by the management committee of the Social Behavioural Studies in HIV and AIDS Honours Programme, by the learners themselves, and by other role players, for the most part coincide with the findings that arise from a analysis of the reported research.

Table 5.2 on the next page is a summary of how the course met the distance education needs and requirements of the adult learners reported in chapters 3 and 4 by designing for them a combination of media and technology. The needs and requirements of learners (as identified from a analysis of the literature and the research itself) can be categorised under the headings of delivery options, course design, delivery, teaching approach, flexibility, presentation, course format, interaction and support.

Table 5.2: What the learners needed and required from distance education and how and to what extend the course met these needs and requirements

Needs and requirements	How and to what extend such needs and requirements were met by the course
Delivery options	The course incorporated a variety of delivery options, including paper format, the learning website, contact sessions, communication channels and video conferencing.
Course design	The course is well designed. It provides engaging and intellectually challenging activities, quizzes and assignments.
Delivery	Delivery did not proceed as seamlessly and reliably as was expected. Technical matters such as servers being down, limited bandwidth, accessibility, and the vagaries of the postal service, were major problems that need to be addressed.
Teaching approach	Because the course is outcomes-based, a learner-centred approach was followed.
Flexibility	The provision of two dates for submitting assignments to the lecturer created more flexibility.
Presentation	Interactive activities were incorporated where possible, and content was integrated with problem-based real-life situations.
Course format	The course is offered in a modularised format. This offers learners some flexibility.
Interaction	Assignments are formulated in such a manner that learners have to interact with the community that is affected by HIV and AIDS as well as their learning community and lecturers/facilitators.
Support	Although academic advisory and student support services were deficient, the degree management committee provides as much support as possible and the situation is improving.

The distance education course (as described in table 5.2) met the majority of identified needs and requirements. Compliance with some needs and requirements (such as delivery and support) are not satisfactory and need improvement.

5.2.2   The value that e-learning can add to a distance education course

> **Research Question 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?

After an analysis of the literature and the evaluation of the learning website, I concluded that e-learning can add value to this distance education course in nutrition and HIV and AIDS. The website offers learners the opportunity to access background knowledge and information on nutrition and HIV and AIDS which cannot be included in the printed format because of how the degree is structured and because of cost constraints. Utilizing e-learning as a means of training offers at least three distinctive advantages.

Firstly, learners are not "dumped" in cyberspace where they have to find their own way. Instead, they are immediately linked to appropriate websites and other documentation that provide them with immediately relevant knowledge and whatever information they may need. From these links they can venture out to other sites and resources.

Secondly, many learners are located in remote areas with very limited (if any) resources of the kind that we associate with an urban society. Learners often complain they cannot find information. Unfortunately, learners are usually unable to find the information they need because (1) they have not acquired the skill of tracking down information during their undergraduate studies, and (2) the information obtainable from Vista University relevant to this relatively new field (nutrition and HIV and AIDS) is limited. But the website provides learners with the means of finding at least *some* of the relevant information and knowledge that they need. The availability of the website as a component of the distance education course means that learners at least have a choice of either travelling (for many a long distance) to the VUDEC Library in the hope of finding some information on the subject, or of travelling a much shorter distance to the nearest Internet café or Vista University learner support centre to access the website there.

Thirdly, the website also reduces what learners have to pay on textbooks (which, even if not imported, can be very expensive indeed). In order to obtain merely adequate knowledge about the subject matter learners need to consult a number of textbooks. It is unfair to expect from learners to buy three to four textbooks that might contain (say) one or two chapters each that provide the knowledge that the learner is looking for. (There are no available textbooks that cover *only* the subject of HIV and AIDS nutrition.) Copyright laws and printing makes it very expensive (and legally difficult) to provide each learner with printed copies of the appropriate chapters. There are a number of websites and other forms of documentation on the website which provide similar information.

Learners can also access electronic journal data bases that provide access to many more academic journals that the Vista Library could offer in hardcopy form. 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."

Therefore, although there is no conclusive evidence from the literature that proves that any media used (including classroom training) display any distinctive or unique features that promote learning, e-learning offers *other features* that can assist learners to reach the outcomes of this course and programme. This is even more applicable in the context of a distance education outcomes-based format, which is the format in which this programme is offered.

After considering the results reported in chapters 3 and 4, I am of the opinion that utilizing e-learning as mode of training (provided that it is properly implemented and presented) for the course in nutrition and HIV and AIDS, helps learners to acquire the knowledge, critical skills and methodologies that are needed for independent, life-long learning. I found it awe-inspiring to observe how some of the learners grew and developed during the year. Their self-confidence grew exponentially as they mastered computer and other technologies, and it is encouraging to see that most of them are deeply aware of how vital it is to acquire these skills.

5.2.3   Internet and e-learning constraints

Research Question 3

What constraints hinder the utilization of e-learning and the Internet in the distance education nutrition and HIV and AIDS course?

Numerous constraints affecting learners, staff, infrastructure and organisation were identified during the research. This coincides with what the literature reported. Many of the learner constraints could be overcome by providing learners with information about the availability of computer and Internet facilities at the VUDEC campus and at the tutor centres. In the case of the inadequacy of learners' computer experience, it is the view of the programme management committee of the Social Behavioural Studies in HIV and AIDS Honours Programme that learners at a postgraduate level *should* be computer literate. Just over 50 per cent of the learners view themselves computer literate. Many of the learners with few computer skills make a concerted attempt to acquire these skills, and, in such cases, their skills usually improve dramatically during the course of the year. Internet costs can become prohibitively high if learners have to access the Internet from home for long periods. However, some learners are allowed to access the Internet from work, and Vista University offers free Internet access to all postgraduate learners.

Constraints involving pedagogy that arose out of the use of various media were addressed by the incorporation of a combination of media and technology (while bearing in mind factors such as costs and other resources such as staff and the production of material). By implementing e-learning and encouraging learners to use the Internet, e-mail and discussion groups, and by offering face-to-face sessions twice a year, the facilitators attempted to dispel the feelings of loneliness and isolation experienced by some learners.

A major constraint that is endemic to printed study material is the problem of distribution. Learners are often issued with incorrect or incomplete study material, or else they receive the materials late (or sometimes not all). This constraint can be addressed by updating and publishing course content on the Internet or by issuing learners with an updated course content CD-Rom. This provides learners with an alternative source of content to work with while they wait for their printed material.

Table 5.3 on the next page list the constraints and the possible solutions that are applicable to the Nutrition and HIV and AIDS e-learning course (These constraints was identified in Table 2.11 of chapter 2 and possible solutions was identified in Table 3.6 of chapter 3 that dealt with a needs analysis and possible solutions to constraints that affected learners in an e-learning situation). The constraints include in Table 5.3 are, learners need computer and Internet access, learners' computer experience, learning environment and learner motivation.

Table 5.3: 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 able to apply for 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 5.3 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 5.4 on the next page lists the next number of constraints and the possible solutions that are applicable to the Nutrition and HIV and AIDS e-learning course (of which some were identified in

Table 2.11 of chapter 2 and possible solutions was identified in Table 3.6 of chapter 3 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 5.4 below 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 5.4: 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 assess 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. (As stated 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 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 5.4 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 5.5 list constraints associated with infrastructure and the organisation.

Table 5.5 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 5.5: 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 5.5 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.

Computers and Internet access for teaching staff are not viewed as a constraint since all staff involved with the degree programme have access to computers and the Internet. In addition, university management and the staff who are involved with the Social Behavioural Studies in HIV and AIDS Honours Programme all support e-learning.

In spite of the fact that there are infrastructural and organisational constraints, there are also ways to address these problems. Although there are an insufficient number of computers available to accommodate all the learners, Vista University does provide technology infrastructure. The workstations are equipped with standard Pentium III computers with Internet access and printer facilities. Unfortunately, however, these computers are not installed with soundcards or CD-Rom drives. This limits the utilisation of technologies that use sound and video. At some of the university's campuses such as the VUDEC campus, the bandwidth can accommodate user demand. But otherwise server availability is unreliable, and servers are often out of disk space or else the server is down. These are constraints that need to be addressed by management.

Vista University does not have a Learning Management System (LMS) or Learning Content Management System (LCMS) in place. Current learner numbers are manageable and managerial and administrative processes are performed manually. However, there is a great demand for this degree – and learner numbers are on the increase. The university needs to address these management systems. Although management are in principle supportive of e-learning, no funds were made available to improve or expand facilities. Many of these constraints will be resolved after the incorporation of VUDEC into Unisa. Unfortunately I cannot say exactly how these constraints will be ameliorated by the merger since I have not yet worked in the Unisa environment for a sufficiently long period of time.

Although there will always be constraints that affect the presentation of an e-learning course, it is possible to overcome many of them – even if solutions are less than ideal and require the acceptance of some compromises on the part of learners and facilitators. With time and increased management support and funding, the constraints can be addressed and learners can be provided with better means and opportunities to access and utilize information.

5.2.4   Interface design

> **Research question 4**
>
> What interface design principles would best facilitate the communication of nutrition and HIV and AIDS knowledge to adult learners from previously disadvantaged communities?

The literature review confirmed and I experienced at first hand that the creation of an effective and efficient learning website is no small task. By designing and developing the website I attempted to address and eliminate (as far as possible) interface design features that gave learners a feeling of being lost or helpless, or that confused and frustrated them. I adopted a learner-centred design that recognised learners' needs, preferences and constraints (Padilla, 2003:1). After considering the literature and the research results, I identified five factors that needed to be taken into account when developing a learner-centred learning website for adult learners from previously disadvantaged communities who are studying nutrition and HIV and AIDS. I identified these factors by means of interviews and discussions with learners, usability testing, and by analysing learner questionnaires that I asked them to complete at various stages during the design, development and implementation of the learning website.

Table 5.6 on the next page list these five factors and gives an indication of how the information was collected. They are the extent to which learners will be involved, the extent to which one really knows and understands one's learners, the analysis of one's tasks and goals exploration, and repeated testing of usability. The implications of these five factors that I implemented during the design and development of the website are discussed below.

Table 5.6: Factors that need to be considered when developing user-centred learning websites

Factor that needs to be considered	Implications
The extent to which learners will be involved	The learners formed part of the design/development/ implementation process and provided their input in discussions, interviews and usability testing. Through talking to learners I established how learners viewed the navigation, orientation and overall design of the learning website. I observed learners during the contact sessions and analysed how they performed their tasks, channelled their work flow, and achieved their goals. Feedback was elicited by means of prototypes, discussions, think-aloud sessions, usability testing and questionnaires. These features were reported in chapter 3.
The extent to which one really knows and understands one's learners	A learner profile was compiled by means of a questionnaire that elucidated each learner's situation with regard to his or her access to computers and his or her level of computer and Internet literacy. These features were reported in detail in chapter 4.
The analysis of one's tasks and goals	I observed and interacted with learners during contact sessions. Learners were questioned about their studies, about what information they needed, and about how they had obtained that information. This was done by means of interviews, formal and informal discussion and observation. These features were reported in chapter 3.
Exploration	I explored different designs and approaches. I consulted various books on web design and visited numerous websites and looked at their designs and usability features before she embarked on the design of the website.
The repeated testing of usability	Usability testing by means of observations and questionnaires was conducted throughout the development, design and implementation cycles. These features were reported in chapter 3 and chapter 4.

Table 5.6 shows us that the application to a design process of a philosophy that is user-centred entails the involvement of the learners from an early stage. This involvement allowed me (the designer) to get to know the learners and to compile a profile of the learners who use the website.

By means of evaluation methods such as interviews, discussions, observations and usability testing, learners provided me with feedback about their views of, needs from, and expectations of the learning website.

During the design phase of the website, I paid close attention to interface design features such as consistency, simplicity, navigation, visual design, display issues and legibility – supported by features such as clarity of language, cognitive directness, human memory limitations, and the focussing of attention. These factors are as discussed in chapters 3 and 4.

I am in agreement with the literature (Bevan, 1999:1; Katz-Haas, 2001:[Online]; Kruse, 2000a:[Online]; Usability Evaluation 2002:[Online]) that in order to create and sustain an effective learning website, one needs to bear in mind the five user-centred factors, to pay careful attention to learners' needs from an early stage of the website's development, and to implement optimal interface design features. Well-designed, user-centred learning websites can motivate and help learners to acquire the knowledge and critical skills they need to achieve their personal and educational goals.

5.2.5   Web usability principles

Research Question 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?

When one looks at the learner profile as depicted in Table 5.7 on the next page, and the reported findings from the interviews and discussion reported in chapter 3, one can see that these learners enrolled in the programme are *older* adults, from various provinces in the country who speak a variety of home languages and who are attempting to obtain new knowledge and skills or else enhance their existing knowledge and skills. Such people certainly do *not* want to experience problems as they try to access the study material or manipulate the online e-learning environment. It is thus of great importance that the website be designed clearly and plainly and in a manner that conforms closely to general web usability principles. Since no two websites or their target audiences are the same, the subject of each usability project should be treated as unique (Preston, No date:[Online]).

Table 5.7 on the next page reflects the personal and demographic information of the learners including sex, age, home language, province in which learner resides, and marital status.

Table 5.7: Personal and demographic information of learners

Characteristics		2002	2003	Significance
		Percentage		
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	
	Mpumalamga	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	

From Table 5.7 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 screen image below illustrates a page of unit one of the learning website. It indicates how the usability principles, as identified from the literature and the research as reported in chapters 3 and 4, were applied to the nutrition and HIV and AIDS website. The principles comprise minimalist design and consistency, organization and navigation, flexibility, efficiently performing web pages, accessibility, interactivity and resolution-independent design.
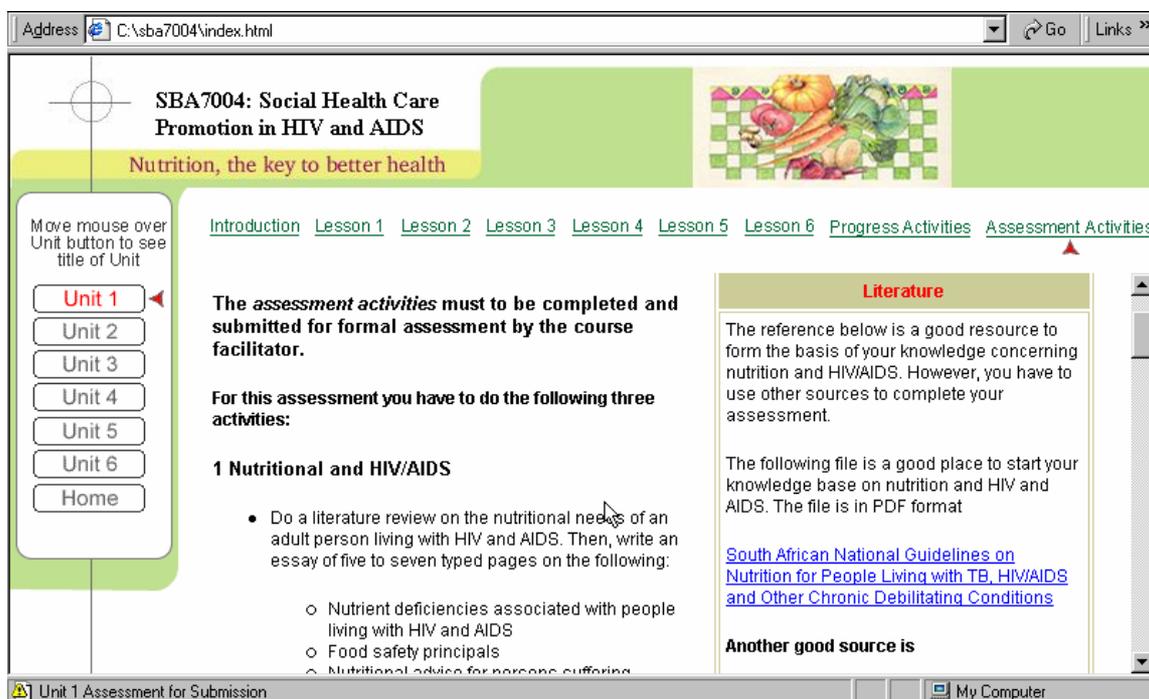
Figure 5.1: A page of the learning website

Figure 5.1 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.

Table 5.8 on the next page summarises how usability principles, as identified from the literature and the research as reported in chapters 3 and 4, were applied to the nutrition and HIV and AIDS website. The principles comprise minimalist design and consistency, organization and navigation, error prevention, flexibility, efficiently performing web pages, accessibility, interactivity, instructor feedback, help support, speedy connection and downloads, and resolution-independent design.

Table 5.8: Usability principles and the implementation of such principles to the nutrition and HIV and AIDS learning website

Principle	Application
Minimalist design and consistency	The website's design is clear and unambiguous. Site elements are visible, obvious and intuitive. These features need to be addressed if usability is to be maximised. During the orientation session learners were given and overview of the website and its features and then they had the opportunity to use it themselves.
Organization/ navigation	The main menu (as a frame) was placed on the left-hand side of the web page and was visible on all pages. When the mouse pointer was moved over the main menu link, a description of what users would find if they clicked on the link, appeared at the top of the menu. A second menu was placed at the top of the pages. This menu had an additional function that showed learners which page they were on. The page link (where the learner is) turns red, and a red arrow below the link points to the link.
Error prevention	After numerous corrections, the website became error-free. Links were current and downloads such as PDF files loaded swiftly.
Flexible, efficient web pages	Web pages, graphics, and download files were kept as small as possible. Coloured text was used sparingly and only in predefined situations.
Accessibility	Content was "chunked" to make for easy access. It was structured into three levels to allow for skimming. Where appropriate, bulleted lists were used. Bolding, italics and blue and underlined hypertext provided emphasis.
Satisfaction	Learners indicated that they were satisfied with the look and feel of the website and that they enjoyed working with the website.
Interactivity	The website allowed for interactivity between learners and the course tools and content. The website allowed for interactivity between learners and other (non-course) websites. This ensured increased usability and learner satisfaction.
Instructor feedback	The facilitator provided timely feedback on assignments and other communications. She was accessible by means of e-mail and telephone, and was available during regular office hours.
Help support	Learners were provided with information on how and where to seek assistance.
Speedy connection and downloads	The website site used small and functional graphics. These enabled speedy connection and download.
Resolution-independent design	The website was designed with resolution-independent pages (layouts as percentages of the available space).

Table 5.8 shows that the incorporation of web usability elements into a learning website produces a functional website that is effective and user-friendly, and one that ensures learner satisfaction.

Results from the formative evaluation questionnaires on the nutrition and HIV and AIDS website as reported in chapter 4 are summarized in the section below.

Results indicated that learners were satisfied with the website and rated the usability **highly**. The majority of learners disagreed (64,16 per cent) with the statement "Learning to operate the website was difficult". Nearly 24 per cent of the learners agreed with the statement, while 12,26 per cent rated the statement neutral. Nearly 90 per cent of the learners agreed that the website was user friendly. Although 66 per cent of the learners felt that the course addressed them personally, a large number of learners rated the statement neutral (25,96 per cent). When this website is further developed and revised, it should be written in a more personal manner.

The majority of learners navigated through the website with ease, although some of the computer illiterate learners took some time to master the navigation and work through the website. Less than seven per cent of the learners agreed with the statement that the navigation was unclear and inconsistent. Fourteen per cent of the learners rated the statement neutral.

The learners agreed that the screen display and design were uncluttered and consistent. Most learners rated the visual impression positively. The majority of learners (60,00 per cent) rated the visual presentation as excellent (See Figure 4.1). Very few learners were neutral towards the screen display, and less than three per cent disagreed with the statement that the screen display was excellent. Most of the learners did not view the screens as too full and overcrowded (39,42 per cent). Only a small number of learners (just over 8 per cent) rated the screen display as distracting, while 12,75 per cent were undecided.

The summative evaluation confirmed that the majority of learners viewed the website as a useful tool for accessing information. The majority of learners reacted positively to the statements concerning working with the website. The results were as follows:

- I enjoyed working with the website (92,45 per cent)
- I think I would make use of the website when studying (92,38 per cent)
- The online content will help me to understand the printed study material better (91,43 per cent)
- I found the activities in each unit useful (92,38 per cent)
- I was impressed with the website (90,56 per cent)
- The website was challenging (84,90 per cent)
- The website was stimulating (90,39 per cent)

Some learners in the interviews and discussions said that they found it more convenient to use the website as a means for accessing information than going to the library.

5.2.6   Theoretical perspectives and learner perceptions

> **Research Question 6**
>
> What theoretical perspectives and adult learner perceptions play a role in the acceptance and utilisation of the Internet and e-learning and as training tools?

If one wants to design a learning website that is intended for adult learners, one needs to have a clear idea of how to organise the instructional material in an optimal way. Since the user interface is the central locus of e-learning, an effective interface design enable the learning experience by allowing the learner to obtain knowledge and expertise that he or she retains (Vilamil-Casanova & Molina, 1996, in Deubel, 2003:[Online]). The design of this website interface was based on theories and learning principles that emphasise that learners should be presented with real-world situations from which they might construct new ideas on the basis of their own knowledge and life experience. Learners were encouraged to make their *own* discoveries and decisions and formulate their *own* views about the subject matter.

Table 5.9 on the next page indicates how three learning theories (Gagne's Conditions of Learning Theory, Bruner's Constructivist Theory, Bandura's Social Learning Theory, Carroll's Minimalist Theory, and Vygotsky's Theory of Social Cognitive Development) were applied to the website and course material so that the online and printed teaching and training materials could be improved.

Table 5.9: How the nutrition and HIV and AIDS course addressed the learning theories applicable to e-learning

Theory and Approach	Addressed by the distance education course
Gagne's Conditions of Learning Theory	
Provide a variety of learning activities	Addressed by assignment activities and a variety of sources
Cognitive domain	Addressed by printed study guide and website
Knowledge	Addressed by printed study guide and website
Comprehension	Addressed by printed study guide and website
Application	Addressed by printed study guide, hyperlinks on website and readers
Analysis	Addressed by printed study guide, hyperlinks on website and readers
Synthesis	Addressed by printed study guide, hyperlinks on website and readers
Evaluation	Addressed by printed study guide, hyperlinks on website and readers
Carroll's Minimalist Theory	
Provided learners immediately with the information that they want	Addressed by website and study guide
Limit cognitive overload	Addressed by website and study guide
Keep pages uncluttered	Addressed by website and study material
Vygotsky's Theory of Social Cognitive Development	
Simplify navigation	Addressed by website
Clearly identify content with appropriate headings and titles	Addressed by website and study guide
Place the most important information on the top-left	Addressed by website

As one can see from the table above, the website and/or the printed study material and (to a lesser extent) the facilitator together and in various ways addressed all the main features of each of the five learning theories.

I proposed a model that links various aspects of users' perception of web technology as a training tool. The model reviews users' attitudes toward web-based environments in a way that integrates the Technology Acceptance Model (TAM), Social Cognitive Theory (SCT), motivational perspective, a self-efficacy perspective and an attitude perspective. The model provides insight into why some learners will more readily accept the Internet and computer technology as a training tool than others.

5.2.7 Delivering distance education by means of a combination of media and technology

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Research Question 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?

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There is a whole range of media and technology that can be used to deliver distance education. However, each of these modes has its own advantages and limitations which need to be considered before an informed decision can be made about what media and technology may be best suited to deliver distance education to adult learners from previously disadvantaged communities studying nutrition and HIV and AIDS. Below is a summary of the advantages and limitations of using a combination of media and technology – as reported by the literature and obtained from an evaluation of the course.

❑ **Advantages**

The advantages of using a combination of media and technology as reported in the literature, and chapters 3 and 4 are summarized loosely into four groups namely, learning experience, access to information, instruction delivery and feedback.

▪ **Learning experience**

The following advantages of using a combination of media and technology for delivering a distance education course in nutrition and HIV and AIDS were arrived at after studying the literature, and the reported discussions and interviews.

- A combination of electronic media and technologies and printed materials allow for more flexible learning. Learners are able to take control of the learning process while proceeding at their own pace and adhering to their own self-directed study and learning needs.
- A combination of electronic media and technologies and printed materials offers learners learning experiences whenever and wherever they want them – irrespective of geographical location or time.
- Electronic media and technologies alleviate the social isolation associated with distance education by providing group activities such as discussion forums, mail lists, and chat sessions and using e-mail to communicate. The contact sessions every three months greatly alleviate the sense of loneliness and isolation.
- Electronic media and technologies accommodate verbal, visual, and aural learning styles equally by offering information and activities through different media and technology.

Because of the diverse background of the adult learners in this study, a combination of media and technology is a more appropriate means to meet learners' needs and offer learners learning experiences whenever and wherever they want them.

▪ **Access to information**

The following advantages of using a combination of media and technology for delivering a distance education course in nutrition and HIV and AIDS were arrived at after studying the literature, and the reported discussions and interviews.

- Electronic media and technologies permit the course to be supplemented and strengthened by data obtained from related websites in other parts of the world.
- Electronic media and technologies provide access to more sources of information and assistance than the course alone would be able to provide.
- Electronic media and technologies provide logical "chunks" of information as and when they are needed. One may compare this to paper-based formats that are predetermined with regard to quantity (number of pages), format (style of publication), and availability (publication date).
- Electronic media and technologies pose challenges because learners have to be actively engaged with the website. They have to select, respond, reject, and in other ways navigate through the content in order to make progress.
- Electronic media and technologies are more enjoyable because they give learners a sense of being in control. Learners enjoy interacting with the information and exercises that are presented.
- Providing learners with a combination of media and technology gives them a greater scope to access course content, knowledge and information.

▪ **Instruction delivery**

The following advantages of using a combination of media and technology for delivering a distance education course in nutrition and HIV and AIDS were arrived at after studying the literature, and the reported discussions and interviews.

- Electronic media and technologies permit certain instructional elements to be delivered asynchronously (learners do not need to be online at the same time).
- Electronic media and technologies permit activities to be offered synchronously. Thus, the facilitator and learners can have group discussions in real-time at prearranged dates and times.
- Electronic media and technologies permit learners to participate in online groups and exchange experience and materials.
- Using different means to deliver instruction and participate in learning activities offers learners

more flexibility in their approach to their studies.

- **Feedback**

  The following advantages of using a combination of media and technology for delivering a distance education course in nutrition and HIV and AIDS were arrived at after studying the literature, and the reported discussions and interviews.

  - Electronic media and technologies allow learners to receive immediate responses to their e-mail enquiries and test results. Test results can be delivered to learners within seconds once they have completed an automatically scored test.
  - Electronic media and technologies enable learners to submit assignments by e-mail. This eliminates the problems that arise when assignments get lost in the post.
  - Electronic media and technologies such as e-mail allow learners to submit assignments by e-mail. Such assignments will have a shorter turnaround time because the facilitator can perform assessment on the computer and assignments can be returned to learners very quickly.
  - Electronic media and technologies permit the facilitator, to some extent, to adapt material to learners' needs and to remedy deficiencies.
  - By giving learners with an alternative means to submit their assignments and by providing prompt feedback, the learning experience is enhanced.

❑ Limitations

The limitations of using a combination of media and technology as reported in the literature, and chapters 3 and 4 are summarized below.

- Using electronic media and technologies for studies is a new concept for many learners.
- Using the Internet for long periods of time can be expensive.
- Many learners have little or no experience in the use of electronic media and technologies.
- Because some learners may regard the process of mastering technology as time-consuming and involving too much trouble, they may refrain from using it.
- Bandwidth limitations may restrict the downloading of instructional media.
- Some learners have difficulty in accessing appropriate hardware and/or software.
- The use of electronic media presupposes the availability of extensive technical and administrative support.
- The Internet can easily distract learners. Undisciplined learners can get sidetracked into checking their e-mail or browsing the web to look for sites that contribute little or nothing to the goals of the course.

Using a combination of media and technology to teach distance education learners has many advantages but it also has its limitations. I am of the opinion using a combination of media and technology to teach distance education learners is a good alternative to using printed materials alone. A combination of media and technology makes learning more interesting and challenging and it exposes learners to more sources of information and real-world data.

5.2.8   Design and development of a distance education course

> **Research Question 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?

To answer this question, I considered all the factors that were addressed in the previous research questions as well in as the findings of the reported research.

❑   **Features of a nutrition and HIV and AIDS course comprising a combination of media and technology**

The distance education course should be designed in such a manner that it utilizes a variety of media and technology. Such variety will accommodate a greater diversity of learning styles and eliminate (or at least decrease) the monotony of traditional one dimensional, linear, black and white, printed materials. The media and technology identified as suitable to accommodate the needs of the distance education course for nutrition and HIV and AIDS is summarized on the next page in Table 5.10. The media found to be most suited for used in the nutrition and HIV and AIDS course were printed material, a website, contact sessions, communication channels and video conferencing. A brief summary of how each of these media and technologies were implemented and used to facilitate the learning experience of the nutrition HIV and AIDS course is also given.

Table 5.10: The features of the combination of media and technology used in the nutrition and HIV and AIDS distance education course.

	Printed material	**Website**	**Contact sessions**	**Communication channels**	**Video conferencing**
Feature	Comprises a study guide with activities and assignments and additional literature compiled in the format of Readings. The study guide covered the course content and the descriptions of activities and assignments.	Covers course guide content in chunked format. Hyperlinks to relevant websites and additional documentation. Provides background information not covered by printed materials.	Three one-week sessions per year. Interaction with fellow learners and facilitator. Facilitation and problem solving activities, academic and administrative.	Telephone, facsimile, e-mail and personal appointments are used for communication between facilitator and fellow learners to communicate content-related issues, ideas and activities.	Visual and audio contact with fellow learners and facilitator. Substitute contact sessions to accommodate learners unable to attend due to distance, time and cost constraints.
Means of facilita-ting learning process	Aims and outcomes for the course. Learning outcomes for each unit. Clearly stated criteria for each assignment	Use of colour and graphics to attract attention and maintain interest. Interactivity involves learners and uses alternative means to familiarise them with the content. Expose learners to all relevant issues related to the HIV and AIDS and how these play a role in the health and well-being of PLWHA.	These are learner-focused. Sessions are focused on learner needs. Lecturer facilitates process. No formal lectures.	Provide means of communication. Alleviate feelings of being isolated. Provide the facilitator with a means of giving support and encouragement.	Learner focused. Sessions are focused on learner needs. Lecturer facilitates process.

Table 5.10 shows how various kinds of media and technology can be used to facilitate the learning process in distance education. These media and technologies provide a more efficient way of

solving distance education learners' academic and administrative problems and of alleviating their feelings of social and academic isolation than do traditional methods.

5.3   Discussion

This section reviews (in the form of methodological, substantive and scientific reflections) what I learned from my research.

5.3.1   Methodological reflection

I examined in depth the processes involved in implementing e-learning as a part of a distance education course. I used the prototype of a model to understand (1) what both the facilitator and the learner need in a distance education course, and (2) how to develop an effective course that accommodates these needs and helps learners to construct their own knowledge. The methodology used in this study was formative and summative evaluation. I discussed these methodologies and data collection instruments in chapter 3. A detailed description was given of how each of these data collection instruments was applied in the study. Multiple sources of evidence were used during the research process to minimize bias on the part of myself or any other persons or circumstances. To achieve consistency in results, the research was conducted over two years with a number of participants, and it used a variety of forms of data obtained from these participants.

It was encouraging to observe that the data collected from the face-to-face interviews and the discussions supported the findings obtained from using the questionnaires. During the interviews, I refrained from giving my opinion or from directing the interview into particular directions by keeping to the interview questions. When I had to respond to a statement or a question from the interviewee, I kept the response as short as possible and avoided making any leading remarks. It must be said that I did not always find it easy to refrain from giving an opinion or drawing attention to a point that had not been explored.

The usability testing gave me new insight into how the learners approached and operated the website. Some learners experienced difficulties where I never anticipated that a problem might occur. In other cases, some 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. After such sessions, I looked into the problems thus revealed and made suitable adjustments. The

think-aloud sessions also helped me to obtain insight into how learners experience working with the website and the thought processes they use to accomplish a task.

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. The learners' demonstrated remarkable insight into what additional tools were needed to support their printed study material and they made some useful contributions. It took numerous sessions of working with the website before most of the navigational, instructional and technical problems could be corrected.

I also asked subject and education experts to review the website. The approach that the experts used to review the website was totally different approach from that of the learners. They focused more on educational practices − and I gained valuable information from their feedback. Their comments were noted and their suggestions were incorporated into the website wherever applicable.

In reflecting on the methodological process, I came to the realization that when one develops a distance education course, one needs to consult widely. All the role players concerned with such a course can make a valuable contribution to the development of a functional and user-friendly course.

5.3.2   Substantive reflection

Adult learners are often impeded by obstacles and obligations such as family commitments, schedule conflicts, and geographical and economic constraints. Traditional face-to-face classes offer learners very limited possibilities for coping with such barriers to learning (Hijazi, 2003:35). We live in a world where there is an increasing demand for alternative means of education, and it is evident from the literature that higher education institutions are progressively incorporating distance education and e-learning to increase access and meet adult learners learning needs within the framework of life-long learning (Charp, 2003:8; Bose, 2003:[Online]; Grooms, 2003:[Online]; Abouchedid & Eid, 2004:15; Ally, 2004:5; Zentel et al, 2004:237).

Anderson and Elloumi express the following opinion about the benefits of education:

> We believe that education is one of the few sustainable means to equip humans around the globe with skills and resources to confront the challenges of ignorance, poverty, war, and environmental degradation. Distance education is perhaps the most powerful means of extending this resource and making it accessible to all (Anderson & Elloumi 2004:16).

I endorse this statement. This statement may appropriately be applied to the HIV and AIDS pandemic in South Africa and the high rate of infection in other parts of Africa. The FAO (No date:[Online]) states that people, especially people in rural areas, have no access to information and are therefore ignorant about how to protect themselves from HIV and how to take care of those who do fall ill. Hand in hand with ignorance go severe poverty, social breakdown and hunger. The question is: How can we educate and inform these people and alleviate their problems in a sustainable way?

I regard distance education and e-learning as one of the primary means at our disposal of addressing the problem. By using distance education and e-learning, those who are in the forefront of the struggle to cope in communities, people such as community workers, teachers, nurses and social workers, can be educated and trained to do what they have to. They in turn can educate and train others in their own communities. Thus we train people to become trainers who can train new trainers, and so on. Distance education and e-learning may also be a more appropriate way of delivering education to groups of learners who come from different ethnic backgrounds, and whose needs and expectations, prior education and life experience, personal learning styles and abilities vary considerably (Mutula, 2002:99; Beller & Or, 2003:24). The results of this research show that learners are indeed extremely diverse.

I concur with the statement of president and chief executive officer (CEO) of Cisco Systems, John Chambers, (2004:[Online]): "I truly believe that the Internet and education are the two great equalizers in life, levelling the playing field for people, companies, and countries worldwide. By providing greater access to educational opportunities through the Internet, students are able to learn more."

While it is one thing to deliver the content, *how* the content is delivered is crucial to the effectiveness of delivery. The study by Lindh and Soames (2004:133) reported that: "The various levels of computer skills and technical knowledge may affect the success of following through the course. The delivery platform therefore should be easy to use, reliable and support the learning".

Results from this study confirm the views of Lindh and Soames (2004:133). Learners possess varied levels of technical knowledge and computer skills. This study revealed that some learners had no technical knowledge and such limited computer skills that even using the mouse was a

challenge. Others were technically more skilled and completely computer literate, and had no problems navigating through the learning website. Although the nutrition and HIV and AIDS course is not totally dependent on computers and the Internet to meet its objectives, one must keep in mind that the perseverance and success of the learners who are not computer literate will be affected by their deficits. The study results also show that learners experienced the website as easy and enjoyable to use, and that they would use it for their studies.

The website was developed as part of the Nutrition and HIV and AIDS course to function as a tool that can provide learners with access to information, challenge them with real life situations, motivate them to explore and construct their own knowledge through the use of technology, and instil in them a greater sense of responsibility towards their work. Mutula (2002:105) also noted these features as reasons for incorporating information and communication technologies at universities.

During the development of the course and website I used a combination of learning theories to accommodate the needs of this course and website, facilitate the growth and development of the learner. Ally has the following view on using a combination of learning theories:

> As there is no single learning theory to follow, one can use a combination of theories to develop online learning materials. The online developer must know the different approaches to learning in order to select the most appropriate instructional strategies. Learning strategies should be selected to motivate learners, facilitate deep processing, build the whole person, cater for individual differences, promote meaningful learning, encourage interaction, provide feedback, facilitate contextual learning, and provide support during the learning process (Ally 2004:6).

While attempting to include all the above features, I also assumed the role of facilitator – as described by Beller and Or (2003:27), "The teacher should be more of a collaborator, mediator and facilitator in the learning process and less the sole source of knowledge, with the students actively shaping their own learning, and the teachers directing, promoting and facilitating the process." With such vast quantities of information available in all areas of study, it is simply not possible for one person to possess all knowledge relevant to a discipline. Learners have to go out and "shape their own knowledge" and challenge their facilitators and peers with what they have gained, thereby promoting collaboration and debate.

At VUDEC the subject content was predominantly offered in the printed format. By incorporating additional media and technology, I aimed to reduce the monotony of the black and white printed materials and make the learning experience more interesting and enjoyable. The literature listed typical media and technology that are used in distance education (Cloete et al., 2003:232; Shih et al., 2003:1; Van Brakel & Chisenga, 2003:479; Wang & Liu 2003). These are listed in Table 5.11 below.

If we compare the nutrition and HIV and AIDS course to the examples listed below, it becomes apparent that I utilized the available media and technology to establish a course that comprises a combination of media and technology. Table 5.11 below lists typical media and technology used for distance education. These media include the printed media, the computer and other telecommunications-dependent media, and human-based media. (The media and technology used in the nutrition and HIV and AIDS course are indicated by the symbol (✓), and those that are not used are indicated by the symbol (×).

Table 5.11: Typical media and technology used in distance education

Media	Technology	This study
Print-based	Study guides	✓
	Readings/Course notes	✓
	Text books	✓
	Assignments	✓
Computer-based	Compact disk (CD)	✓
	Stiffy disk	✓
Computer communication	E-mail	✓
	Internet	✓
	Online documentation	✓
	Online learning	✓
	Intranet training	×
	Virtual educational networks	×
Telecommunication-based	Telephone	✓
	Facsimile	✓
	Satellite-delivered learning	×
Telecommunication-based	Video-conferencing	✓
Audio-visual based	Videotape	×
	Film	×
Audio-based	Audio-cassette tapes	×
Visual-based	Graphs, graphics, illustrations	✓
	Photographs, slides	×
Human-based	Lecturer/ facilitator	✓
	Face-to-face contact	✓
	Mentor	×

From Table 5.11 it can be seen that media and technology from all the major categories, namely printed media, computer and telecommunication-related media, and human-based media, were included in this study.

Although I could not find any reported literature on the implementation of e-learning as part of a postgraduate distance education course in public nutrition, a study reporting on the exploratory evaluation of four newly developed online modules for post-registration nurses (Wilkinson et al., 2004:421) confirmed both the positive and negative aspects of what I had found in this study and was reported in chapters 3 and 4.

These positive aspects and negative aspects, as reported by Wilkinson et al. (2004:421), are tabulated below. In each instance (if relevant) I comment on the similarities or differences in this study when compared to those reported by Wilkinson et al. (2004:421).

Table 5.12 below lists and describes the positive aspects of using e-learning courses for the training of nurses compared to using a website as part of a distance education course in nutrition and HIV and AIDS.

Table 5.12: Positive aspects of e-learning courses

Positive aspects (Nursing study)	Positive aspects (Nutrition and HIV and AIDS study)
Linked theory to practice	Learners demonstrated their ability to link theory to practice in their assignments
Increased clinical confidence and skills	Increased skills
Relevance to practice	Relevance to practice
Improved IT skills	Improved IT skills
Highlighted accountability	Highlighted accountability
Enjoyed time out to learn	Not applicable
Enjoyed networking	Enjoyed networking
Enjoyed web materials	Enjoyed web materials
Flexibility	Flexibility
Improved theoretical knowledge	Improved theoretical knowledge
Emphasized patient perspective	Learners become more aware of community-related issues
Lots of information	Lots of information
Enjoyed links to other resources	Enjoyed links to other resources

Table 5.12 shows that both studies made similar positive findings about the use of e-learning modules to train and educate learners.

Table 5.13 below lists the negative aspects of using e-learning modules for the training of nurses and compares them to the negative aspects of using a website as part of a distance education course in nutrition and HIV and AIDS.

Table 5.13: Negative aspects of e-learning modules

Negative aspects (Nursing study)	Negative aspects (Nutrition and HIV and AIDS study)
Induction day too overwhelming	Introduction to the website as part of the course was done in one-hour sessions over two days. This made the experience less overwhelming.
Time management needs to be more disciplined.	Time management needs to be more disciplined. Learners do not know how to manage their time.
Problems accessing the web	The problems that learners had accessing the web were related to the time of day when they attempted to do so or they did not have the means to access the Internet.
Problems with passwords	Although the website is currently not password-protected, it will be in the near future.
Shortage of IT skills	Shortage of IT skills
Need for clarification of outcomes	Not applicable. Outcomes were clearly outlined.
Practice supervision difficult to find	Not applicable.
Lacked human interaction (isolating)	To some extent, this was also true. To counteract this, contact sessions were introduced to facilitate interaction. Learners often dropped in at the offices of facilitators to say "hello".
Prefer more group interaction (seminars)	Learners preferred to have more contact with facilitators. Contact sessions were therefore introduced.
Needed more study leave	Although learners were not asked directly, some of them complained that they did not have enough time to study.
WebBoard was confusing	Not applicable (No integrated system available)
Overwhelmed by the information	Initially some learners felt overwhelmed because the subject content was unfamiliar to most of them. But over time and because they worked systematically through the content, they managed to cope. The content was also offered in a "chunked" format in the website to prevent this problem.

Table 5.13 shows that both studies reported some similar negative aspects of using e-learning modules in their respective disciplines. Some of the negative aspects noted in the nursing study had already been addressed in the nutrition and HIV and AIDS course and website.

As indicated in this study and other studies, there are a number of constraints associated with the implementation of e-learning in higher education institutions. The literature indicates that lecturers/facilitators at other sub-Saharan Africa institutions have similar constraints with which to deal (Mutula, 2002; Axmann et al., 2002:272; van Brakel & Chisenga, 2003:479; Dutton, 2004:77).

Some of these most pressing constraints are listed below:
- Access to personal computers and the Internet
- Learners' limited computer skills
- Dial-up connections from home
- Limited bandwidth
- Cost of Internet access and telephone lines
- Limited resources and infrastructure
- Technical and telecommunication problems
- Maintenance and technical support
- Learner and staff development and training
- Funding

I acknowledge that there are numerous obstacles that impede the implementation of e-learning in distance education situations. Potential ways to overcome or limit the impact of some of these constraints were discussed in chapter 2 of this study. I have identified a number of problems that confront me, co-workers and learners alike. These include:
- The high cost of textbooks
- Bookstores being reluctant to stock academic books that are not "bestsellers"
- Learners from small towns or villages being unable to buy academic books locally
- Copyright issues that affect the reproduction of sections of textbooks
- Costs of printing and reproduction
- The logistics involved in updating printed study material, the costs of doing so, and the vast amount of material that needs to be reproduced at distance education institutions limits updating and reproduction to every third year.
- Research and knowledge into specialised areas such as nutrition and HIV and AIDS only emerge later in the progression of the disease. Information on these issues in current textbooks is often limited, and then often only cover small sections. It is therefore not cost effective to buy these textbooks.
- Reputable organisations such as the WHO and the FAO are constantly publishing new research and information about health and related issues on the Internet. Sometimes these publications are

also available in printed format. While the printed format may be available, learners might have difficulty in obtaining it – for reasons mentioned above.

If one considers these problems, one can see that e-learning is a more viable option in a distance education situation. Chambers (2004:149) concurs with this view: "While daunting logistical challenges still remain … making life saving information available in real time, to anyone worldwide, is within our reach."

One has to explore new possibilities. Making e-learning available in spite of all constraints allows learners to use these facilities and make improvements and adjustments as they arise. The literature show that various authors view e-learning as a viable means of distributing and delivering educational material at distance and residential institutions (Geueke, & Stausberg, 2002:197; Beller & Or, 2003:24; Chan & Welebir, 2003:196; Katz, & Yablon, 2003:48 – 49; Rubenstein, 2003:28; van Brakel & Chisenga, 2003:478 -479).

Some of the most important features of e-learning are:
- It gives more people access to education.
- It theoretically allows access to content anywhere and at any time.
- It permits convenient and flexible learning.
- Learners may study at their own pace.
- It gives access to the latest information worldwide.
- Its content is more interactive and engaging.
- Learners are not dependent on lecturers to deliver content.
- It reduced distribution costs.

In their thought-provoking article on the impact of ICT-based distance learning on sub-Saharan Africa, Van Brakel and Chisenga have the following to say:

> It is clear that the transformation of the distance learning landscape in sub-Saharan Africa is being driven by a number of economic, technological and social trends. Probably the most important trend is the phenomenal increase in the demand for higher education. This has been addressed by the fact that ICT-based distance learning techniques are in a far better situation than residential teaching to increase the annual number of graduates (Van Brakel & Chisenga 2003:485).

5.4   Scientific reflection

From the reported results concerning the eight research sub-questions, I drew certain conclusions about what was learned from the study and what constraints needed to be taken into account when designing an effective distance education course.

5.4.1   What I learned from the study

What I have learned from the study is summarized under the categories incorporation of media and technology into distance education courses, gaining information and skills, use of media and technology, contact sessions and feedback, facilitator, learners and their studies, technology and infrastructure and general.

- **Incorporation of media and technology into distance education courses**

  The incorporation of media and technology to train distance education learners is a viable route to follow but the following factors need to be considered:
  - No advantage accrues from merely placing an existing study guide on the Internet. An e-learning course is fundamentally different in the advantages it offers from a printed study guide and notes.
  - Chunk" work into sections or themes. This allows learners with the appropriate background knowledge to skip those sections with which they are familiar and to focus instead on new and unfamiliar work.
  - The application and operation of media and technology in a distance education course should be simple and easy to use. If learners experience too many problems, they will not use it.

- **Gaining information and skills**

  By using a combination of media and technologies in teaching a distance education course learners are able to access a number of sources for information while gaining new skills. The following features were identified:
  - Learners are exposed to more sources of information and one places them in a position in which they are required critically to evaluate their sources and substantiate their choices.
  - Learners are exposed to a wider range of current information from a range of sources.
  - Learners realised that computer and Internet literacy was a skill they needed to enhance their studies and to be competitive in the job market. Although mastering these skills can be time-consuming, they persevered and succeeded.
  - Learners improve their writing and reasoning skills.
  -

- **Use of media and technology**

When using a combination of media and technologies in teaching a distance education course the following was identified concerning the learners:

Learners display a positive attitude towards using computers and other technologies for their studies.

- Learners need clear guidance if they are to change their attitudes towards the use of technology to assist them in their studies.
- Learners will only use media and technology to the extent to which they will help them to achieve their goals, which are usually to complete and pass their assignments and examinations.
- One should provide the essential and core components such as the study guide and assignments in printed *and* electronic format. If learners have problems accessing the electronic format, they still have the printed version.

- **Contact sessions and feedback**

When using a combination of media and technologies in teaching a distance education course the following was identified concerning the contact sessions and feedback:

 "Face-to-face contact between learners and facilitator is an important feature for a distance education programme. Learners need to see their facilitators face-to-face. In our experience with postgraduates, there should be at least two contact sessions per year. One of these contact sessions should be early in the year so that learners can be given the opportunity to orientate and familiarise themselves with the setting and form a mental map of essential campus features such as where staff offices and other facilities are.

- Contact sessions should be used to inform, interact, discuss, present and facilitate. Formal lecturers should be limited to the minimum.
- During contact sessions, read through the assignments with the learners. Although the assignments are clear and detailed, the learners still need the facilitator to *tell* them what is expected from them in the assignment. This reassures them.
- If learners need to give feedback, present clear, step-by-step procedures. Learners do not assume the obvious – and have difficulty in applying written information in practice.
- Learners value the immediate feedback they receive in assignment assessment and in answer to e-mail enquiries. Learners also enjoy the computer-based quizzes and the immediate automated feedback that gives them their scores.

- **Facilitator**

When teaching a post-graduate, outcomes-based, distance education course the following need to be considered:

- The lecturer functions as a *facilitator* in the true sense of the word. The facilitator facilitates the learning process by providing guidance where it is needed and by encouraging critical thinking and problem solving skills.
- Facilitators should be available and accessible to learners. Learners should have the assurance the facilitator is there for them. Encourage learners to communicate with their facilitator if their personal circumstances are hampering their studies. Adult learners, especially women, often have to deal with family-related and other problems that are beyond their control.

- **Learners and their studies**

When using a combination of media and technologies in teaching a distance education course the following was identified concerning learners and their studies:
In many cases, distance education is the only viable option for learners because most of the Vista University learners cannot afford to attend a residential university.

- Learners can be successful in their studies through distance education. With perseverance and commitment from the learner, and support and motivation from the facilitator, learners do succeed.
- The outcome-based approach provides learners with the opportunity to construct their own knowledge and apply this acquired knowledge to real-life situations.
- Outcomes-based distance education requires a lot of input and dedication from the facilitator. Because of this, the number of learners should accordingly be limited. Do not make any assumptions about learners.
- Do not assume that they have a certain level of background knowledge, experience or skills. The more diverse (culturally and in other ways) the learner population is, the less one may assume anything about the learners concerned.
- Explain every feature of the study material and content clearly and in detail, especially if learners are unfamiliar with the distance education mode.
- Learners are uninformed about how e-learning can be used as a tool to assist them in finding information for their studies.

I identified the following constraints that impeded the incorporation of a combination of media and technology in a distance education course.

▪ **Technology and infrastructure**

- The waste of time and money caused by technological constraints such as difficulty in downloading information, slow connectivity, and servers being down is a cause of frustration.
- Servers cannot accommodate a large number of workstations. Servers often went down if too many learners accessed the Internet at once.
- Sometimes Internet and telephone connections were broken because of the theft of Telkom's (copper) telephone lines (a common crime in South Africa).
- Dial-up connections from home were slow because of limited bandwidth.
- Internet access via telephone lines becomes very costly if learners spend more than three hours on the Internet three or more time per week.
- Technical and telecommunication problems.
- Technology infrastructure. Old and outdated PCs.
- Technical support. Support staff were not always available to attend to urgent problems.
- Maintenance of equipment. Limited maintenance was carried out.
- PC availability. There was a limited number of PCs available for learners to work on. Sometimes learners had to wait in turn to access a computer.

▪ **General**

- The university management provided the minimum in the way of support and facilities.
- Many of the learners had limited or no computer skills.
- The need for learner and staff development and training.
- Funding for improvement or updating of equipment was limited.

After I had considered the literature and evaluated the course, I formulated the strategies given in the next section to guide the design and development of a distance education course that consists of a combination of media and technology.

5.4.2 Strategies for the design and development of a distance education course using a combination of media and technology

The following strategies need to be considered when designing and developing a distance education course using a combination of media and technology. The strategies are grouped loosely into factors concerning the design and development of a learning website and factors related to the offering of a distance education course to adult learners from developing countries.

- **The design and development of a learning website**

  - The web design should adhere to usability principles, and be clear, simple and easy to use.
  - Website navigation should be clear and intuitive.
  - Visual design should be interesting but simple. Use visual features such as colour and graphics sparingly and functionally.
  - Make use of "chunking" and hyperlinks. "Chunked" content with appropriate headings and bulleted sections provide learners with manageable pieces of content that can be covered in a short period of time. Provide hyperlinks to the latest and additional information or other relevant documentation.
  - Consider possible constraints and devise means to reduce their impact – or else eliminate them completely.
  - Anticipate technical problems and provide learners with a printed and online FAQ (frequently asked questions) document that deals with technical issues. Provide support such as a help-line to which learners can turn for assistance.
  - Make use of electronic scored quizzes or tests that provide immediate automated feedback. Embed clues that prompt the correct answers in the quiz in those cases where the answers are wrong. This allows learners to revise the quiz and make corrections while the quiz is still fresh in their memory.

- **Offering of a distance education course**

  - Create a standard look and feel for the entire course.
  - Know who the learners are. Compile a learner profile that accommodates unique features such as ethnic diversity, the incidence of older learners, and levels of computer skills.
  - Provide an introductory section that states the aims and objectives of the course, and shows how to integrate the various media and technology that support the course. Provide printed and online instructions on how, for instance, the website works and what it has to offer.
  - Provide learners with swift feedback to their enquiries and assignments. This confirms that the facilitator is "out there" and is aware of (and cares about) learners and their needs.
  - Activities should be learner-centred and should allow for individual and group work while promoting skills development.
  - Promote learner and facilitator interaction by means of communication channels such as telephone, fax, e-mail and discussion groups. Constantly remind learners of these channels.
  - Organise face-to-face contact sessions for learners as a group. Although not all the learners feel the need for such contact, the majority of learners have a need to interact with their peers and facilitators and to reduce their feelings of social isolation.

5.5   Recommendations

5.5.1   Recommendations for introducing policy and practice

It becomes obvious when one surveys the increased demand for quality distance education that higher education institutions should take cognisance of the inherent advantages and limitations that accompany the utilization of a combination of media and technology in the offering of distance education courses. E-learning will increasingly form a substantial part of the media and technology used for the successful delivery of distance education. This study has indicated that such a mode of delivery, not withstanding the constraints, can be successfully implemented. Institutions that use this mode of delivery should identify the optimal capabilities of the selected instructional media and technologies and utilize them effectively and efficiently. Strategies should also be formulated to ensure adequate, dependable delivery and facilitate ease of use for learners as well as for staff.

On a tactical level, this study could be used to support the reasons for implementing e-learning as a part of a distance education delivery mode in departments or faculties.

On an operational level, the study identified and described factors and constraints that need to be considered when utilizing a combination of media and technology for distance education. On the one hand, higher education institutions may need to revise their policies on education course and programme development, presentation, management, and assessment. On the other hand, coherent policies are needed in the following areas: the ability of staff to deliver academic content, issues about delivery pedagogy, and the availability of media and technology to staff and learners.

Academic staff either need training – or else they need to demonstrate conclusively that they are competent to teach effectively by means of distance learning using a combination of media and technology. Academic staff also need to be actively involved in the design and development of such study materials. Media and technology should be made available to learners through on-campus and tutor centres. Learners need to be motivated to master new electronic media. Institutions should provide them with facilities, support and assistance that will enable them to utilize these media and technologies effectively.

Although it will take some time for academic staff and learners to master e-learning skills fully, e-learning is a viable option with endless opportunities to provide effective and efficient life- long learning for adult learners.

5.5.2 Recommendations for further research

This study, like all other research, needs to be independently verified. Future research on this subject should entail an equivalent study that is based on a similar (or the same) environment and resource, but that uses a larger and more diverse learner population (sample) so that the generalization of the data can be applied more accurately. Such a reproduction would also enhance the validity of the questions that are used in the survey.

Recommendations for further research include:
- establishing how the advancement of new communication and information technologies will affect the delivery of effective learning and information to developing communities. Constraints associated with these technologies should be identified and possible solutions should be formulated and tested in experimental conditions.
- developing innovative ways of using technology in distance education to increase learner participation and improve the quality of the education provided.
- identifying what kinds of instructional designs are effective for just-in-time, place-independent, on-demand learning.
- evaluating how non-linear or linear navigation represented in a textual, symbolic or auditory mode affects learning.
- further applied research to explore the use of cellular telephone technology to remind learners of imminent due dates, to make announcements, and to inform learners about updates on the course's website.
- further research into the production of videotapes that will clarify and expand upon the content of the printed text and of the website itself.

5.5.3 Recommendations for further development

Further development in the establishment of a database that consists of case studies related to the field of study taken from real life situations is needed. Such case studies can then be used to teach learners how to apply their knowledge to real life situations. In such circumstances, learners would be required to assess the situation and suggest possible solutions and actions that would resolve the issues presented in the case study. Further development is also needed into the establishment of online collaborative projects and interactive educational games. Coincident with these developments, terms of reference and methodologies should be put in place for developing and managing the utilization of various media and technology in distance higher education.

5.6   Conclusion

There is an increased worldwide interest in the application of e-learning in tertiary distance education institutions. If this trend if to be implemented, availability and access to appropriate technology that meets the needs of learners and teaching staff are essential. Strategies should be put in place to support the application of technology and the successful delivery of learning solutions. Consideration should also be given to critical success factors such as establishing a culture of support for ongoing learning and ensuring such support from management. The potential benefits of e-learning as part of a distance education course comprising combination of media and technology will only materialize when the constraints are acknowledged and strategic solutions are introduced as part of a well-planned and properly supported education/training environment.

REFERENCES

Abels, E.G., Domas White, M. & Hahn, K. 1998. A user-based design process for Web sites. Internet Research: Electronic Networking Applications and Policy, 8(1):39–48.

Abouchedid, K. & Eid, G.M. 2004. E-learning challenges in the Arab world: Revelations from a case study profile. *Quality Assurance in Education*, 12(1):15-27.

Ali Habash, M. 1998. Media delivery in computer based instruction: Web based vs. CD-ROM based. [Online]. Available: http://naweb.unb.ca/proceedings/1998/habash/habash.html [1 July 2003].

Al-Khaldi, M.A. & Al-Jabri, I.M. 1998. The relationship of attitudes to computer utilization: New evidence from a developing nation. *Computers in Human Behaviour*, 14(1):23-42.

Allen, R.J. 1997. It's a circus out there! *CBT Solutions*: 33-37, March/April.

Ally, M. 2004. Foundations of Educational Theory for Online Learning. In: T. Anderson & F. Elloumi (Ed.). *Theory and practice of online learning,* Athabasca: Athabasca University, Canada, pp. 3-31.

Ambler, S.W. 2000. User interface design: Tips and techniques. [Online].
Available: http://www.ambysoft.com/userInterfaceDesign.pdf [6 June 2003].

Anderson, T. & Elloumi, F. 2004. Introduction. In: T. Anderson & F. Elloumi (Ed.). *Theory and practice of online learning,* Athabasca: Athabasca University, Canada, pp. 3-31.

Anon. 1998. Long-distance learning. *InfoWorld* [Online], 20(36):72-73, July 9. Available: EBSCO Online/Academic Search Premier [21 October 2000].

Anon. 2001. Learning goes the distance. (Innovators). (Brief Article). *NEA Today* [Online], 19(4):21(1) Jan. Available: Gale Group: Infotrac/Expanded Academic ASAP [25 July 2003].

Atkins, M.J. 1993. Theories of learning and multimedia applications: An overview. *Research Papers in Education*, 8(2):251-271.

Attström, R. & Larsson, K. 2002. The role of e-learning in nutrition. *The South African Journal of Clinical Nutrition*, 15(2):S5, Supp.

Austin, I. O'B. (No date). Capacity management for continuous improvement in distance education. [Online]. Available:http://www.col.org/resources/publications/SmallStates00/2_conf_proc_Austin.pdf [8 July 2003].

Axmann, M., Fourie, W. & Papo, W.D. 2002. Adding net value: The nature of online education at a South African residential institution. *EMI 39:3/4 – ICTS AND MEDIA.* Refereed paper 267-273.

Balderstone, S.J. & Mabin, V.J. (No date). A review of Goldratt's Theory of Constraints (TOC): lessons from the international literature. [Online].
Available: http://www.mfgexcellence.com/articles/downloads/ToCResults.pdf [3 July 2003].

Bandura, A. 1986. *Social foundations of thought and action*. Englewood Cliffs: Prentice-Hall.

Bandura, A. 1997. *Self-efficacy: The exercise of control*. Englewood Cliffs: Prentice-Hall.

Baron, L.C. & Goldman, E.S. 1994. Integrating technology with teacher preparation. In: L.C. Baron & E.S. Goldman (Ed.). *Technology and education reform*. San Francisco: Jossey-Bass Publishers, pp. 99-120.

Bartolic-Zlomislic, S. & Bates, A.W. 1999. Investing in online learning: Potential benefits and limitations. *Canadian Journal of Communication*, 24(3):349-366, Summer.

Bates, T. 1999. Cultural and ethical issues in international distance education. In: Engaging Partnerships Collaboration and Partnership in Distance Education UBC/CREAD conference, Vancouver, September 21-23, Canada, pp 1-13.

Beattie, K. 1994. How to avoid inadequate evaluation of software for learning. In: K. Beattie, C. McNaught & S. Wills (Eds.). Interactive Multimedia in University Education: Designing for Change in Teaching and Learning. Proceedings of the IFIP TC3/WG3.2 Working Conference on the Design, Implementation and Evaluation of Interactive Multimedia in University Settings, Melbourne, Victoria, Australia, 6-8 July, 1994. (IFIP Transactions A-59) (pp. 245-258). Amsterdam: Elsevier.

Becker, D. 1999. Training on demand. *TechWeek*, 26-29, Jan. 11.

Beller, M. & Or, E. 2003. Learning technologies at the service of higher education: Global trends and local Israeli opportunities. *Work*, 20(1):23-33.

Beneke, P. 1999. The importance of a student profile and an accountable open learning student counselling model. Dissertation MA Ed, Vista University, Bloemfontein.

Benjamin, D. 2000. Designing for usability: Optimising the UCD framework. In: Proceedings of the CHI-SA 2000 Conference on Usability and User-Centred Design, June, Pretoria, pp. 1-10.

Bevan, N. 1999. Usability issues in web site design. In: Proceedings of 6th Interactive Publishing Conference, November. [Updated May 2001].

Bevan, N. 2000. Introduction to usability and user-centred design: Tutorial. In: Proceedings of the CHI-SA 2000 Conference on Usability and User-Centred Design, June, Pretoria.

Bless, C. & Higson-Smith, C. 1995. *Fundamentals of social research methods: An African perspective*. 5th Edition. Cape Town: Juta and Co, Ltd.

Bloom, B.S., Hastings, J.T. & Madaus, G.F. 1971. *Handbook on formative and summative evaluation of student learning*. New York: McGraw-Hill.

Blustain, H., Goldstein, P. & Lozier, G. 1999. Assessing the New Competitive Landscape. In: R.N. Katz and Associates (Ed.). *Dancing with the devil: Information technology and the new competition in higher education*. San Francisco: Jossey-Bass Publishers, pp. 51-71.

Boettcher, J.V. 1999. 21st Century Teaching and Learning Patterns: What Will We See? *Syllabus Magazine, June Highlights* [Online], 12(10), June.
Available: http://www.syllabus.com/syllabusmagazine/Jun99_magfea.html [24 January 2003].

Boisvert, L. 2000. Web-based learning. *Information Systems Management* [Online], 17(1):35-40, Winter. Available: EBSCO Online/Academic Search Premier [9 September 2000].

Bonk, C.J. & Reynolds, T.H. 1997. Learner-centered web instruction for higher-order thinking, teamwork, and apprenticeship. In: B.H. Khan (Ed.). *Web-based instruction*, Englewood Cliffs, New Jersey: Educational Technology Publications, pp. 167-178.

Bose, K. 2003. An e-learning experience: A written analysis based on my experience with primary school teachers in an e-learning pilot project. *International Review of Research in Open and Distance Learning* [Online], Oct. Available: EBSCO Online/MasterFILE Premier [15 March 2004].

Bostock, S. 1997. Designing web-based instruction for active learning. In: Khan, B.H. (Ed.). *Web-based instruction*, Englewood Cliffs, New Jersey: Educational Technology Publications, pp. 225-230.

Breen, A.M., Burton-Houle, T. & Aron, D.C. 2002. Applying the Theory of Constraints in health care: Part 1 – The Philosophy. *Quality Management in Health Care*, 10(3):40-46, Spring.

Brock, E. & Sulsky, L. 1994. Attitudes towards computers: Construct validation and relations to computer use. *Journal of Organizational Behaviour*, 15:17-35.

Brown, D.G. 2004. Taking charge of learning: Tips for students. *Campus Technology*. [Online]. Available: http://www.campus-technology.com/article.asp?id=8470 [30 April 2004].

Brown, K.G. & Gerhardt, M.W. 2002. Formative evaluation: an integrative practice model and case study. *Personnel Psychology* [Online], 55(4): 951:33, Winter.
Available: Gale Group:Infotrac/Expanded Academic ASAP [6 August 2003].

Brush, T. A. Uden, L. 2000. Lorna using computer-mediated communications to enhance instructional design classes: A case study. *International Journal of Instructional Media* [Online], 27(2):157-164, Nov. Available: EBSCO Online/Academic Search Premier
[1 October 2000].

Burke, J. & Slavin, N. 2000. Just-in-time Accounting education. *CPA Journal* [Online], 70(4):46, 5p, Apr. Available: EBSCO Online/Academic Search Premier [24 July 2003].

Cahoon, B. 1998. Teaching and learning Internet skills. In: S. Imel (Ed.). *Adult learning and the Internet*. New Directors for Adult and Continuing Education Series. San Francisco: Jossey-Bass, pp. 102-115.

Carliner, S. 2002. Determining constraints for e-learning. [Online].
Available: http://saulcarliner.home.att.net/oll/elearningconstraints.htm [30 June 2003].

Carnevale, D. & Olsen, F. 2003. How to succeed in distance education. *Chronicle of Higher Education* [Online], 49 (40): A31, 3 p, June 13, Available: EBSCO Online/Academic Search Premier [24 July 2003].

Cato, J. 2001. *User-centered web design*. London: Addison-Wesley. 321 p.

Chale, E.M. & Michaud, P. 1997. Distance learning for change in Africa. [Online]. Available: http://www.idrc.ca/acacia/03230/04-dlearl.html [14 June 2002].

Chambers, J. 2004. How technology can lift the world. *Global Agenda*, (2):148-149, Jan.

Chambers, J. 2004. Vision: Education, standards of living and the Internet. [Online]. Available: http://newsroom.cisco.com/dlls/tln/exec_team/chambers/chambers_edu.html [20 April 2004].

Chan, P.S. & Welebir, B. 2003. Strategies for e-education. *Industrial and Commercial Training*, 35(5):196-202.

Charp, S. 2003. Technology for all students. *T H E Journal*, 30(9):8, Apr.

Chih-Hsiung, T. & Corry, M. 2001. A paradigm shift for online community research. *Distance Education*, 22(2):245-263.

Clark, R.E. 1994. Media will never influence learning. *Educational Technology Research and Development*, 42(2):21-30.

Cloete, L.M. 2001. The education and training of cataloguers: A training resource programme. Thesis. D Phil (Information Science), Pretoria University.

Cloete, L.M., Snyman, R. & Cronje, J.C. 2003. Training cataloguing students using a mix of media and technologies. *Aslib Proceedings*, 55(4):223-233.

Cohen, D. J. & Lippert, S. K. 1999. The lure of technology: Panacea or pariah? *Journal of Management Education* [Online], 23(6):743 -746, Dec. Available: EBSCO Online/Academic Search Premier [18 October 2000].

Compeau, D.R. & Higgins, C.A. 1995. Application of social cognitive theory to training for computer skills. *Information Systems Research*, 6(2):118-143.

Creswell, J.W. 2003. Research design. Qualitative, quantitative, and mixed methods approaches. 2nd edition. London: Sage Publications.

CUErgo, (No date). Ergonomic guidelines for user-interface design. [Online].
Available: http://ergo.human.cornell.edu/ahtutorials/interface.html [20 July 2003]

Cypress Lake Studios, 2003. Practical applications of hypermedia. [Online].
Available: http://www.cypresslakestudios.com/articles/usinghypermedia.html [22 August 2003].

Daniel, J.S. 1996. Mega-universities and knowledge media: Technology strategies for higher education. London: Kogan Page Limited.

Danielson, J., Lockee, B., & Burton, J. 2000. ID and HCI: 'A Marriage of Necessity' In: B. Abbey (Ed.). *Instructional and cognitive impacts of web-based education*, London: Idea Group Publishing, pp. 118-128.

Davis, F.D., Bagozzi, R.P. & Warshaw, P.R. 1992. Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Applied Social Psychology*, 22(14):1111-1132.

Deubel, P. 2003. An investigation of behaviorist and cognitive approaches to instructional multimedia design. *Journal of Educational Multimedia and Hypermedia* [Online], 12(1):63-290, Spring. Available: Gale Group: Infotrac/Expanded Academic ASAP [25 July 2003].

Deci, E.L. & Ryan, R.M. 1987. The support of autonomy and the control of behaviour. *Journal of Personality and Social Psychology*, 53(6):1024-1037.

DiPaolo, A. (No date). What distance students want. Peterson's Distance Learning Advice. [Online]. Available: http://www.petersons.com/distancelearning/code/articles/distancelearnwant12.asp [6 June 2003].

Dolence, M.G., & Norris, D.M. 1995. Transforming higher education: A vision for learning in the 21st century. Ann Arbor, MI: The Society for College and University Planning. [Online].
Available: http://141.211.140.236/catalog/catalog.htm [12 October 2000].

Driscoll, M. & Reid, Jr., J.E. 1999. Web-based training: An overview of training tools for the technical writing industry. *Technical Communication Quarterly*, 8(1):73-86, Winter.

Duderstadt, J.J. 1999. Can colleges and universities survive in the Information Age? In: Katz, R.N. and Associates (Eds.). *Dancing with the devil: Information technology and the new competition in higher education*. San Francisco: Jossey-Bass Publishers, pp. 1-25.

Dutton, W.H., Cheong, P.H. & Park, N. 2004. The social shaping of a virtual learning environment: The case of a university-wide course management system. *Electronic Journal of e-Learning*, 2(1):69-80, February.

Dyrud, M. A. & Worley, R. B. 2001. Distance Education, Part Three. *Business Communication Quarterly*, 64 (i3):80, Sept. Available: Gale Group/Expanded Academic ASAP [25 July 2003].

Eastmond, N. 1994. Assessing needs, developing instruction, and evaluating results in distance education. In: B. Will (Ed.). *Distance education strategies and tools.* New Jersey: Educational Technology Publications, pp. 87-107.

Elbon, S. 2002. IT in nutrition communication. *The South African Journal of Clinical Nutrition*, 15(2):S6, Supp.

E-learning development: how to develop an online course. 2003. Lesson 3: Interface Design. [Online]. Available: http://stylusinc.com/WebEnable/HR/lesson3.php [8 September 2003].

El-Tigi, M. & Branch, R.M. 1997. Designing for Interaction, Learner Control, and Feedback During Web-Based Learning. *Educational Technology*: 23-29, May-June.

FAO: see Food and Agriculture Organisation of the United Nations.

Farrington, G.C. 1999. The new technologies and the future of residential undergraduate education. In: Katz, R.N. and Associates (Eds.). *Dancing with the devil: information technology and the new competition in higher education*. San Francisco: Jossey-Bass Publishers, pp. 73-94.

Fender, D. L. 1999. Distance education. *Professional Safety*, 44(10):26, 4p, Oct. Available: EBSCO Online/Academic Search Premier [24 July 2003].

Food and Agriculture Organisation of the United Nations. Newsroom. 2003. Feeding hope: nutrition plays key role in HIV/AIDS care. [Online].
Available: http://www.fao.org/english/newsroom/news/2003/13560-en.html [2 April 2004].

Forsyth, I. 2001. *Teaching & learning materials & the Internet*. 3rd Edition. London: Kogan Page.

Fox, R.E. (No date). The Theory of Constraints – fad or future? [Online].
Available: http://www.tocc.com/Articles/FadFuture.PDF [6 June 2003].

Galpin, V., Sanders, I., Turner, H., & Venter, B. 2003. Computer Self-Efficacy, Gender, and Educational Background in South Africa. *IEEE Technology and Society Magazine*, 22(3):43-48, Fall.

Geueke, M. & Stausberg, J. 2003. A meta-data-based learning resource server for medicine. *Computer Methods and Programs in Biomedicine*, 72:197-208.

Gibson, J.W. & Herrera, J.M. 1998. A Pilot Study to Set Up an Asynchronous Web-based Distance Learning Program in Undergraduate Business. 7th Annual Lifelong Learning Conference. National University, CA: National University Research Institute. p1-5.

Gillani, B.B. & Relan, A. 1997. Incorporating interactivity and multimedia into web-based instruction. In: *Web-based instruction*, B. H. Khan (Ed.). New Jersey: Educational Technology Publications, pp. 231-237.

Ginsburg, L. 1999. Educational technology: searching for the value added. *Adult Learning*, 10(4):12-15, Summer.

Goldberg, M.W. 1997. CALOS: First results from an experiment in computer-aided learning. In: ACM's 28th SIGCSE Technical Symposium on Computer Science Education. New York, NY: Association for Computing Machinery.

Goldratt, E.M. 1992. *The Goal*. 2nd Edition. Cape Town: Creda Communications.

Gottfredson, C. 2002. Rapid task analysis: The key to developing competency-based e-learning. *The e-Learning Developers Journal*: 1-9, June 25.

Govindasamy, T. 2002. Successful implementation of e-Learning pedagogical considerations. *Internet and Higher Education*, 4(3-4):287–299.

Gray, M. 1996. *Web growth summary*. [Online].
Available: http://www.mit.edu/people/mkgray/net/web-growth-summary.html [7 October 2000].

Grooms, L.D. 2003. Computer-mediated communication: a vehicle for learning. *Review of Research in Open and Distance Learning*, [Online]. Oct. Available: EBSCO Online/MasterFILE Premier [15 March 2004].

Hall, B. 1997. *Web-based training cookbook*. New York: John Wiley & Sons.

Hannafin, M., Hannafin, K., Hooper, S., Rieber, L., & Kini, A. 1996. Research and research with emerging technologies. In: *Handbook for research for educational communications and technology,* D.H. Jonassen (Ed.). New York: Simon & Schuster Macmillan, pp. 378-402.

Heydenrych, J.F. 2004. The effective learning experience: Restructuring towards improved practice and capacity. In: Information seminar on online learning: A presentation delivered on 26 August 2004, Pretoria.

Hijazi, S. 2003. Interactive technology impact on quality distance education, *Electronic Journal of e-Learning*, 1(1):35-44.

Hill, J.R. 1997. Distance learning environments via the World Wide Web. In: B.H. Khan (Ed.). *Web-based instruction*, Englewood Cliffs, New Jersey: Educational Technology Publications, pp. 75-80.

Hills, H. 2000. Not in the net yet. *People Management*, 6(5):33.

Hoffman, S. 1997. Elaboration theory and hypermedia: Is there a link? *Educational Technology*, 37(1), 57-64.

Hofstetter, F.T. 1998. *Internet literacy*. New York: Irwin/McGraw-Hill. 304 p.

Holt, S. 1999. Web-based training helps one family man move up. *InfoWorld* [Online], 21(23):80, June 7. Available: EBSCO Online/Academic Search Premier [7 September 2000].

Hopey, C. 1999. Technology and adult education: rising expectations. *Adult Learning / Technology*, 10(4):26-27, Summer.

Horton, W. 2000. *Designing web-based training*. New York: John Wiley & Sons. 607 p.

Huber, J.T., Schoonover, W.K. & Kashka, M. 2000. HIV/AIDS and nutrition: A bibliometric analysis. *Medical Reference Services Quarterly*, 19(4):29-37, Winter.

Hyman, C., & Kaufman, S. 1989. Nutritional impact of acquired immune deficiency syndrome: A unique counselling opportunity. Journal of the American Dietetic Association, April:520-524, 527.

IHEP: see INSTITUTE FOR HIGHER EDUCATION POLICY.

ITC's Definition of distance education. [Online]. 2003.
Available:http://www.itcnetwork.org/definition.htm [25 August 2003].

Iadevaia, D. 1999. An internet-based introductory college astronomy course with real-time telescopic observing. *T.H.E. Journal* [Online], 26(6):71 2p, Jan. Available: EBSCO Online/Academic Search Premier [2 June 2002].

Igbaria, M. 1993. User acceptance of microcomputer technology: An empirical test. *OMEGA: International Journal of Management Science*, 21;73-82.

Igbaria, M. & Olivari, J. 1995. The effect of self-efficacy on computer usage. *OMEGA: International Journal of Management Science*, 23(6):587-605.

Ives, B. & Jarvenpaa, S. L. 1996. Will the Internet revolutionize business education and research? *Sloan Management Review* [Online], 33-41, Spring. Available: Infotrac [19 October 2000].

Jolliffe, A., Ritter, J. & Stevens, D. 2001. *The online learning handbook: Developing and using web-based learning*. London: Kogan Page.

Jonassen, D. H., Dyer, D., Peters, K., Robinson, T., Harvey, D., King, M., & Loughner, P. 1997. Cognitive flexibility hypertexts on the Web: Engaging learners in meaning making. In: B H. Khan (Ed.). *Web-based instruction*, Englewood Cliffs, New Jersey: Educational Technology Publications, pp. 119-133.

Jonassen, D. 1999. Designing constructivist learning environments. In: C.M. Reigeluth (Ed.). *Instructional-design theories and models: a new paradigm of instructional theory*, Vol. II. New-York: Lawrence Erlbaum, pp. 215-239.

Jones, M.G. & Farquhar, J.D. 1997. User interface design for web-based instruction. In: B.H. Khan (Ed.). *Web-based instruction*, Englewood Cliffs, New Jersey: Educational Technology Publications, pp. 239-244.

Kang, M. & Byun, H.P. 2001. A conceptual framework for a web-based knowledge construction support system. *Educational Technology*: 48-52, August.

Karayan, S. & Crowe, J. 1997. Student perceptions of electronic discussion groups. *T.H.E. Journal* [Online], 24(9):69, 3p, Apr. [3 June 2002].

Kassop, M. 2003. Ten ways online education matches, or surpasses, face-to-face learning. *The Technology Source,* May/June, [Online].
Available: http://ts.mivu.org/default.asp?show=article&id=1059 [5 July 2003].

Katz, R.N. 1999. Competitive strategies of higher education in the Information Age. In: Katz, R.N. and Associates (Eds.). *Dancing with the devil: information technology and the new competition in higher education.* San Francisco: Jossey-Bass Publishers, pp. 27-49.

Katz, Y.F. & Yablon, Y.B. 2003. Online university learning: cognitive and affective perspectives. *Campus-Wide Information Systems*, 20(2):48-53.

Katz-Haas, R. 2001. User-Centered Design and Web Development. [Online].
Available: http//www.stcsig.org/usability/topics/articles/ucd%20_web_devel.html [6 April 2003].

Kearsley, G. 1994a. Conditions of learning (R. Gagne). [Online].
Available: http://www.gwu.edu/~tip/gagne.html [12 June 2003].

Kearsley, G. 1994b. Constructivist theory (J. Bruner). [Online].
Available: http://www.gwu.edu/~tip/bruner.html [12 June 2003].

Kearsley, G. 1994c. Minimalism (J. M. Carroll). [Online].
Available: http://www.gwu.edu/~tip/carroll.html [12 June 2003].

Kearsley, G. 1994d. Social development theory (L. Vygotsky). [Online].
Available: http://www.gwu.edu/~tip/vygotsky.html [12 June 2003].

Kember, D., & Gow, L. 1994. Orientations to teaching and their effect on the quality of student learning. *Journal of Higher Education*, 65(1):58-74, Jan/Feb.

Kilby, T. 1997. *What is web-based training?* WBT Information Center. [Online].
Available: http://www.filename.com/online/wbt/pages/whatiswbt/htm [19 Augustus 2000].

Kilby, T. 1999. *Frequently asked questions*. WBT Information Center. [Online].
Available: http://www.filename.com/online/wbt/pages/faq/htm [11 October 2000].

Kolasa, K.M. 2002. The role of IT in nutrition education. *The South African Journal of Clinical Nutrition*, 15(2):S9, Supp.

Koyanagi, M. (No date). Putting courses online: Theory and practice. [Online].
Available: http://www.ils.unc.edu/disted/cmi/final2.html [16 June 2003].

Kozma, R.B. 1987. The implications of cognitive psychology for computer-based learning tools. *Education Technology*, 27(11): 20-25.

Kraak, V.I. 1995. Home-delivered meal programs for homebound people with HIV/AIDS. *Journal of the American Dietetic Association*, April:476-481.

Kroder, S.L., Suess, J. & Sachs, D. 1998. Lessons in launching web-base graduate courses. *T.H.E. Journal* [Online], 25(10):66, 4p, May. Available: EBSCO Online/Academic Search Premier [24 July 2003].

Kroll, L. 1999. Good morning HAL. *Forbes Magazine* [Online], March 8, 14 paragraphs. Available: http://www.forbes.com/forbes/99/0308/At Work Good morning, HAL.htm [10 October 2000].

Kruse, K. 1999. *Real world WBT: lessons learned at the Fortune 500.* ASTD International Conference & Exposition. Atlanta, GA: The American Society for Training and Development.

Kruse, K. 2000a. Effective user interface design. [Online]. *Learning Circuits -- ASTD's Online Magazine All About E-Learning*.
Available: http://www.learningcircuits.org/may2000/may2000_webrules.html [6 April 2003].

Kruse, K. 2000b. Five web-based training perils, and how to avoid them. [Online]. Available: http://www.learningcircuits.org/learningcircuits. [18 June 2003].

Kruse, K. 2000c. What are "synchronous" and "asynchronous" training? [Online]. Available: http://www.e-learningguru.com/articles/art1_7.htm [6 June 2003].

Kubala, T. 1998. Addressing student needs: teaching on the Internet. *T.H.E. Journal* [Online], 25(8):71:4, March, Available: EBSCO Online/Academic Search Premier [24 April 2002].

Kurup, P. 1999. Training in EDA heads for an online future. *Electronic Engineering Times* [Online], 1066:108, June 21. Available: EBSCO Online/Academic Search Premier [7 September 2000].

Laurillard, D. 1994. The role of formative evaluation in the progress of multimedia. In: K. Beattie, C. McNaught & S. Wills (Eds.). Interactive Multimedia in University Education: Designing For Change in Teaching and Learning. Proceedings of the IFIP TC3/WG3.2 Working Conference on the Design, Implementation and Evaluation of Interactive Multimedia in University Settings, Melbourne, Victoria, Australia, 6-8 July, 1994. (IFIP Transactions A-59). Amsterdam: Elsevier, pp. 287-293.

Lawson, T.E. 1974. *Formative instructional product evaluation: Instruments & strategies*. New Jersey: Educational Technologies Publications.

Lee, W.W. & Owens, D.L. 2000. *Multimedia-based instructional design*. San Francisco: Jossey-Bass Pfeiffer.

Lesser, L.M. 1998. Technology-rich standards-based statistics: Improved introductory statistics at the college level. *T.H.E. Journal* [Online], 25(7):54, 4p, Feb. Available: EBSCO Online/Academic Search Premier [24 January 2003].

Le Vallée, J. 2002. Producing web sites. *The South African Journal of Clinical Nutrition*, 15(2): S9, Supp.

Liaw, S. 2001. Developing a user acceptance model for web-based learning. *Educational Technology*, Nov-Dec:50-54.

Lindh, J. & Soames, C. 2004. A dual perspective on an online university course. *Electronic Journal on e-Learning*: 2(1), February:129-134.

Lockee, B., Moore, M. & Burton, J. 2002. Measuring success: Evaluation strategies for distance education. *Educause Quarterly*, 1:20-26.

Lynch P.J. & Horton, S. 1999. *Web style guide: Basic design principles for creating web sites*. London: Yale University Press.

Maerhoff, G.I. 2002. A classroom of one: How online learning is changing our schools and colleges. [Online]. SANTEC Information update No 3, July. Available: http://www.santecnetwork.org.

Mager, R.F. 1991. *Making instruction work*. London: Kogan Page.

Maher, K. 1998. Inventing the virtual classroom. *Interactive Magazine*:23-28, August.

Maher, J.H. & Kur, C.E. 1983. Constructing good questionnaires. *Training and Development Journal*, 37(6):100-110. June.

Maslowski, R. & Visscher, A.J. 1999. Formative evaluation in educational computing research and development. *Journal of Research on Computing in Education*, 32(2):239-254.

Maslowski, R., Visscher, A.J., Collis, B. & Bloemen, P.P.M. 2000. The formative evaluation of a web-based course-management system within a university setting. *Educational Technology*: 5-19, May-June.

McAlpin, J. 1998. On-line and F2F students: Is there really any difference? In: 2nd UNC Workshop on Technology for Distance Education, North Carolina State University. Raleigh, NC: North Carolina State University, pp. 6-7.

McGrath. A. J. 1998. Partners in Learning: Twelve ways technology changes the teacher-student relationship. *T.H.E. Journal* [Online], 25(9):58-62, Available: EBSCO Online/Academic Search Premier [24 July 2001].

McMahon Casey, K. 1997. Malnutrition associated with HIV/AIDS. Part one: Definition and scope, epidemiology, and pathophysiology. *Journal of the Association of Nurses in AIDS Care*, 8(3):24-32, May/June.

McManus, T.F. 1999. *Delivering instruction on the World Wide Web*. University of Texas at Austin. [Online]. Available: http://ccwf.cc.utexas.edu/~mcmanus/wbi.html [15 July 2000].

McMullen, T.B. (1998). *Introduction to the Theory of Constraints (TOC) management system*. London/New York: St. Lucie Press. 212p.

Meyer, K. A. 2003. The web's impact on student learning: a review of recent research reveals three areas that can enlighten current online learning practices. *T H E Journal* [Online], 30(10):14-21, May. Available: Gale Group: Infotrac/Expanded Academic ASAP [25 July 2003].

MICROSOFT CORPORATION. 1999. San Diego State University Case Study. [Online]. Available: http://www.microsoft.com/education/hed/studies/caseh55.htm Microsoft Corporation [16 August 2000].

Miller, S.M. & Miller, K.L. 2000. Theoretical and practical considerations in the design of web-based instruction. In: B. Abbey (Ed.). *Instructional and cognitive impacts of web-based education*, London: Idea Group Publishing, pp. 156-177.

Milliron, M.D. & Miles, C. L. 1999. Aha! The Internet changes nothing. *Community College Week*, *Supplement Technology* [Online], 11(18):3-5, Spring. Available: EBSCO Online/Academic Search Premier [2 October 2000].

Moore, C. 1994. Attitudes towards computers, the influence of sex stereotypes, experience, ownership, and mathematics. *Unisa Psychologia*, 21(2):20-27.

Moore, M. & Kearsley, G. 1995. Research on Effectiveness. In: *Distance education: a systems view*. Boston: Wadsworth Publishing, pp. 1-25.

Morris, B.A. 1999. Distance learning. *Rough Notes* [Online], 142(9):32-34, Sept.
Available: Bell & Howell information service/ProQuest [24 January 2001].

Mouton, J. & Marais, H.C. 1988. *Basic concepts in the methodology of the social sciences*. Pretoria: Human Science Research Council.

Mulligan, R. & Geary, S. 1999. Requiring writing, ensuring distance-learning outcomes. *International Journal of Instructional Media* [Online], 26(4):387-395. Available: EBSCO Online/Academic Search Premier [1 October 2000].

Murphy, C.A. Coover, D. & Owen, S.V. 1989. Development and validity of the computer self-efficacy scale. *Educational an Psychological Measurement*, 49:893-899.

Mutula, S.M. 2002. E-learning initiative at the University of Botswana: challenges and opportunities. *Campus-Wide Information Systems*, 19(3):99-109.

Ngokha, G. & Heydenrych, J. 2004. Online Teaching and learning. In: J. Heydenrych & D. Govender (Ed.). *Distance learning technologies in context*, Volume 1, Pretoria: Unisa Press, pp. 23-44.

Nichols, M. 2003. A theory for eLeaning. *Educational Technology & Society* [Online], 6(2):1-10. Available: http://ifets.ieee.org/periodical/6-2/1.html [17 May 2003].

Nielsen, J. 2000. *Designing web usability*. New York: New Riders. 419p.

Nielsen, J. 2003a. Summary of usability inspection methods. [Online].
 Available: http://www.useit.com/papers/heuristic/inspection_summary.html [18 June 2003].

Nielsen, J. 2003b. Usability 101. Jacob Nielsen's Alert Box. [Online].
Available: http://www.useit.com/alertbox/20030825.html [25 Augustus 2003].

Nielsen, J. 2003c. eLearning Usability. Jacob Nielsen on eLearning Usability. [Online].
Available: http://www.du.edu/~rdreylin/usability.html [4 September 2003].

Norman, D.A. 1988. *Design of everyday things*. New York: Currency Doubleday.

Norman, S. 2004. International open forum on e-learning standards. *Summary report on the International forum on e-learning standards*, Montreal, March 4 & 5.

Ogle, B. 2002. IT and nutrition training. *The South African Journal of Clinical Nutrition*, 15(2): S10, Supp.

Ohl, T.M. & Cates, W.M. 1997. Applying metaphorical interface design principles to the world wide web. *Educational Technology*: 25-37, Nov-Dec.

Oniang'o, R. 1998. The technical cooperation project between the government of South Africa and the Food and Agriculture Organisation. In: A.M. Omwega & P.M.N. Kuzwayo (Eds.). Public Nutrition. Nutrition Society of South Africa: Plenary and Symposium Proceedings Sun City South Africa, 26-30 May 1998, pp. 27-32.

Orr, B. 1999. *A significant difference*. [Online]. Available: tenb.mta.ca/anygood/asigdiff.shtml [12 October 2000].

Owston, R. 1999. *The teaching web: A guide to the world wide web for all teachers*, York University, California. [Online]. Available: www.edu.yorku.ca/~rowston/home.html [21 October 2000].

Padilla, M. 2003. Strike a balance: Users' expertise on interface design. IBM developerWorks, pp. 1-10. [Online]. Available: http://www-106.ibm.com/developerworks/web/library/wa-ui/#2 [17 March 2004].

References

Pantazis, C. 2002. Maximizing e-learning to train the 21st century workforce. *Public Personnel Management* [Online], 31(1):21-27, Spring. Available: EBSCO Online/Business Source Premier [2 October 2003].

Passerini,K. & Granger, M.J. 2000. A developmental model for distance learning using the Internet. *Computers & Education*, 34:1-15.

Patsula, P. J. 1999. Applying learning theories to online instructional design. [Online]. Available: http://www.patsula.com/usefo/webbasedlearning/tutorial1/learning_theories_full_version.html [25 July 2003].

Piwoz, E.G. & Preble, E.A. 2000. HIV/AIDS and nutrition: A review of the literature and recommendations for nutritional care and support in Sub-Saharan Africa. Washington, DC: SARA Project Bureau for Africa, Office for sustainable development, US Agency for international development.

Potter, C. 2002. Programme evaluation. In: M. Terre Blanche & K. Durrheim (Ed.). *Research in practice: applied methods for the Social Sciences*, Cape Town: University of Cape Town Press, pp. 209-226.

Powell, G.C. 2001. The ABCs of online course design. *Educational Technology*, 11(4): 43-47, July-August.

Perraton, H., Creed, C. & Robinson, B. 2002. Teacher Education Guidelines: Using Open and Distance Learning. Technology, Curriculum, Cost, Evaluation. United Nations Educational, Scientific and Cultural Organization, Paris (France). Division of Higher Education and Research, pp 1-68.

Preston, P. (No date). Ways to test: Having decided to test your site, what are the considerations and methods for making it more usable? *New Media Age*, June 19, pS6, 2. Available: Gale Group: Infotrac/Expanded Academic ASAP [25 July 2003].

Raab, R.T., Ellis, W.W. & Abdon, B.R. 2002. Multisectoral partnerships in e-learning. A potential force for improved human capital development in the Asia Pacific. *Internet and Higher Education*, 4:217–229.

Rabe, M. 2003. Statement on web-based resource: Interview, 4 September.

Rahman, S. 1998. Theory of constraints. A review of the philosophy and its applications. *International Journal of Operations & Production Management*, 18(3/4):336-355.

Ravden, S.J. & Johnson, G.I. 1989. *Evaluating usability of human-computer interfaces: A practical method*. New York: John Wiley & Sons.

Reeves, T.C. 1994. Text design guidelines. [Online].
Available: http://mime1.marc.gatech.edu/MM_Tools/TDG.html [25 July 2003].

Reeves, T.C. & Hedberg, H.G. 2003. *Interactive learning systems evaluation*. Englewood Cliffs, New Jersey: Educational Technology Publications.

Reigeluth C.M. & Frick, T.W. 2003. *Formative research: A methodology for creating and improving design theories*. Indiana University.

Rickard, W. 1999. Technology, education, and the changing nature of resistance: Observations from the Educom Medal award winners. *EduCom Review*: 34(1):4245. Jan/Feb. [Online].
Available: http://www.educause.edu/ir/library/html/erm9915.html [26, October 2000].

Robinson, T. 1999. Trainers say self-paced web courses work best. *Internet week* [Online], 759:32-33, April. Available: EBSCO Online/Academic Search Premier [9 September 2000].

Rogers, B. 1998. Plenary keynote address: Public nutrition – What, why & how? In: A.M. Omwega & P.M.N. Kuzwayo (Ed.). Public Nutrition. Nutrition Society of South Africa: Plenary and Symposium Proceedings, Sun City South Africa, 26-30, May 1998, pp. 4-20.

Rowley, D., Lujan, H., & Dolence, M. 1998. Strategic choices for the academy: How demand for lifelong learning will re-create higher education. San Francisco: Jossey-Bass Publishers. 272p.

Rubin, J. 1994. *Handbook of usability testing: How to plan, design, and conduct effective tests*. New York: Wiley & Sons. 330p.

Rubenstein, H. 2003. Recognising e-learning's potential and pitfalls. *Learning and Training Innovations*, 4(4):38, May/June.

Ruffini, M.F. 2000. Systematic planning in the design of an educational web site. *Educational Technology*: 58-64, March-April.

Russell, M. 1999. Online learning communities: Implications for adult learning. *Adult Learning*, 10(4):28-31, Summer.

Russell, T. 1999. *The no significant difference phenomenon*. [Online].
Available: http://teleeducation.nb.ca/nosignificantdifference/ [12 July 2000].

Sakamoto, T. 2003. E-learning in Japanese universities. *Industry & Higher Education*, 17(6):397-404.

Sangster, A. & Lymer, A. 1998. How to survive a new educational era. *Issues in Accounting Education* [Online], 13(4):1095-1110, Nov. Available: EBSCO Online/Academic Search Premier [2 October 2000].

Schank, R. 1999. Courses of action. *People Management*, 5(20):54-56, Oct 14.

Schreiber, D.A. 1998. Instructional Design of Distance Learning. In: D.A. Schreiber & Z.L. Berge (Ed.). *Distance Training*, San Francisco: Jossey-Bass Publishers, pp. 37-65.

Schrum, L. 2002. Oh, what wonders you will see: Distance education past, present, and future. (Feature: then, now, & beyond). *Learning & Leading with Technology*, 30 (i3):6, p. 6, Nov. Available: Gale Group/Expanded Academic ASAP [25 July 2003].

Schulze, S. 2000. Education and the Internet: perspectives and trends at South African universities. *South African Journal of Education*, 20(3):248-252.

Schutte, J.G. 1997. Virtual teaching in higher education: The new intellectual superhighway or just another traffic jam? Northridge, CA: California State University.

Shah, Z., George, V.A. & Himburg, S.P. 1999. Computer-assisted education for dietetic students: A review of literature and selected software, *Journal of Nutrition Education*, 31(5), p255(5), Sept-Oct. Available: Gale Group/Health Reference Center-Academic [27 July 2003].

Shih, T.K., Antoni, G.D., Arndt, T., Asirvatham, A., Chang, C., Chee, Y.S., Dow, C., Chia, F., Hung, J.C., Wu, K., Jin, Q., Jung, I., Leong, H.V., Li, S., Lin, F.O., Liu, J., Sala, S. & Wang, Y. 2003. A survey of distance education challenges and technologies. *Journal of Distance Education Technologies*, 1(1):1-21, Jan-Mar.

Shrivastava, P. 1998. Critical mass benefits of Web-based teaching. (Presented 12 February 1998 at the Stop Surfing-Start Teaching National Conference, University of North Carolina.) Myrtle Beach. 4p.

Shrivastava, P. 1999. Management classes as online learning communities. *Journal of Management Education* [Online], 23(6):691-702, Dec. Available: EBSCO Online/Academic Search Premier [12 September 2000].

Sigot, A.J. 2002. Nutrition education and the global information highway: Use of on-line applications and selected packages. *The South African Journal of Clinical Nutrition*, 15(2): S23, Supp.

Smulders, D. 2001. E-Learning Web Course Usability. [Online]. *Learning Circuits ASTD's Online Magazine All About E-Learning*. Available: http://www.learningcircuits.org/glossary.html [5 August 2003].

Snail, N.I. 2003. Statement on web-based resource: Contact session, 13 February.

Snyden, C. 2001. Paper prototyping. [Online]. IBM Developer works. Available: http://www-106.ibm.com/developersworks/usability/us-paper/ [4 October 2001].

Steed, C. 1999. *Web-base training*. Hampshire: Gower Publishing Limited.

Steenkamp, J. 2000. Management of HIV positive patients in Southern Africa – Cost-effective management or denial. *South African Journal of Clinical Nutrition*, 13(3):130, August.

Steiner, V. 1995. *"What is Distance Education?"* Distance Resource Learning Network. [Online]. Available: http://www.dlrn.org/library/dl/whatis.html [25 Augustus 2003].

Stewart, J. & Wright, V.H. 2004. E-learning in Allied Health Care. Athletic therapy today – Human Kinetics, 9(1):7-9, Jan.

Stokes, S. 2000. Learning Space enlivens online training: Although expensive, Version 4.0 delivers compelling courses while lowering support costs and stretching training dollars. *InfoWorld* [Online], 24(22) i30:57, July. Available: INFOTRAC/General BusinessFile Internat'l [21 October 2000].

Struwig, F.W. & Stead, G.B. 2001. *Planning, designing and reporting research*. Cape Town, South Africa: Pearson Education.

Swales, C. 2000. Knowledge series: Editing distance education materials. Vancouver, BC: Commonwealth of Learning.

Switzer, K. 2002. Students as learners and users: enhancing usability for your online course. [Online]. Available:http://www.ecollege.com/news/EdVoice_arch_0619.learn [25 July 2003].

Tan, S.C. & Hung, D. 2002. Beyond information pumping: creating a constructivist e-learning environment. *Educational Technology*: 48-54, Sept-Oct.

Terre Blanche, M. & Kelly, K. 2002. Interpretive methods. In: M. Terre Blanche & K. Durrheim (Ed.). *Research in practice: applied methods for the Social Sciences*, Cape Town: University of Cape Town Press, pp. 123-146.

Trifonopoulus, M., Martin, J., Hamilton, S., Collier, A., Kishchuk, N., De Roose, E., Hohns, T. & Kuhnlein, H.V. 2002. *The South African Journal of Clinical Nutrition*, 15(2):S26, Supp.

Twigg, C.A. 1994. The changing definition of learning. *Educom Review* [Online], 29(4).
Available: http://www.educause.edu/pub/er/review/reviewArticles/29422.html [26 October 2000].

UCISA, (No date): The training and learning options. [Online].
Available: https://www.ucisa.ac.uk/groups/ sdg/docs/publications/it6.doc [18 May 2003].

Usability basics. 2002. [Online]. Available: http://www.usability.gov/ [2 May 2003].

Usability evaluation in e-learning development. 2002. Nov 10. [Online]. Available:
http://www.ecc.org.sg/cocoon/ecc/website/services/newsletter/feel04/article10.pdf [27 July 2003].

Usability first ™, 2002. Introduction to usability. [Online].
Available: http://www.usabilityfirst.com/intro/index.txl [23 September 2002].

Vaas, L. 2001. The E-Training of America. *PC Magazine* [Online], 20(22):1, 4p, 26 Dec.
Available: EBSCO Online/Academic Search Premier [24 July 2003].

Vallerand, R.J. 1997. Toward a hierarchical model of intrinsic and extrinsic motivation. *Advances in Experimental Social Psychology*, 27:271-360.

Van Brakel, P.A. & Chisenga, J. 2003. Impact of ICT-based distance learning: the African story. *The Electronic Library,* 21(5):476-486.

Vankatesh, V. 1999. Creation of favorable user perceptions: Exploring the role of intrinsic motivation. *MIS Quarterly*, 23(2):239-260.

Van Vuuuren, D. & Maree, A. 2002. Survey methods in market and media research. In: M. Terre Blanche & K. Durrheim (Ed.). *Research in practice: applied methods for the Social Sciences*, Cape Town: University of Cape Town Press, pp. 269-286.

Veldman, F. 2002. The effect of nutritional status on HIV/AIDS. *The South African Journal of Clinical Nutrition*, 15(3), Supplement 2:S4.

Venter, I., Marais, D., De Muynk, R. & Shedden, A. 2001. Computer-aided learning in disadvantaged communities in the Southern Cape and Karoo: A nutrition education initiative. *South African Journal of Clinical Nutrition*, 14(3):106-111.

Vorster, H.H., Bourne, L.T., Venter, C.S., & Oosthuizen, W. 1999. Contribution of nutrition to the health transition in developing countries: A framework for research and intervention. *Nutrition Reviews*, 57(11): 341-349, Nov.

Wang, C. & Liu, Z. 2003. Distance education: basic resources guide. *Collection Building*, 22(3):120-130.

Ward, J. 1998. Community college student perceptions of online instruction experiences. *Education at a Distance*, 12(3):6.

Wenhold, F.A.M., Wolmarans, H. & Nordhoff, H.I. 2002. Design, development and evaluation of a multimedia programme in anthropometry. *The South African Journal of Clinical Nutrition*, 15(2): S17, Supp.

West, G. B. 1999. Teaching and technology in higher education: changes and challenges. *Adult Learning*, 10(4):16-18, Summer.

Weston, T.J. & Barker, L. 2001. Designing, Implementing, and Evaluating Web-based Learning Modules for University Students. *Educational Technology*, 41(4):15-22, Jul-Aug.

Wilkinson, A., Forbes, A., Bloomfeld, J., Fincham Gee, C. 2004. An exploration of four web-based open and flexible learning modules in post-registration nurse education. *International Journal of Nursing Studies*, 41(4):411-424, May.

Willis, J. 2000. The maturing of constructivist instructional design: Some basic principles that can guide practice. *Educational Technology*, 40(1): 5-16.

Wills, B. 2003. Distance education at a glance: Guide #1, distance education: an overview. Online: http://www.uidaho.edu/eo/distglan.html [22 August 2003].

Wilson, B.G., Jonassen, D. H., & Cole, P. (1993). Cognitive approaches to instructional design. [Online] In: G. M. Piskurich (Ed.). *The ASTD handbook of instructional technology,* pp. 21.1-21.22. New York: McGraw-Hill. Available: http://carbon.cudenver.edu/~bwilson/training.html [1 Augustus 2003].

Worley, R.B. 2000. The medium is not the message. *Business Communication Quarterly* [Online]. 63(3)93-103, Sep. Available: Bell & Howell information service/ProQuest [24 January 2001].

Wyatt, J.B. 1997. A new way of teaching for a new generation. *Christian Science Monitor* [Online], 89(65):18. Available: EBSCO Online/Academic Search Premier [23, January 2001].

Zentel, P., Bett, K., Meister, D.M., Rinn, U. & Wedekind. 2004. A change process at German university: innovation through information and communication technologies? *Electronic Journal on e-Learning*, 2(1):237-246, Feb.

APPENDIX A

Cover letter and informed consent form

COVER LETTER and INFORMED CONSENT FORM

Department of Information Science
University of Pretoria
INVESTIGATOR: Leonie Steyn
Contact Details: e-mail: steyn-l@staff.vista.ac.za

TITLE: **A Training Resource: Nutrition, Health and HIV/AIDS**

Dear Learner

The purpose of this study is to investigate the use of the Internet and a web site as a medium to train learners in order to expand the delivery options for distance training at the Vista University Distance Education Campus (VUDEC). The study will also investigate what you the learner would expect form such a web site in relation to the usability, functioning and content of such a site. We would also like to establish a learner profile.

Benefits

The learners registered at Vista University will benefit from an improved understanding of the study needs of learners and the availability of modules offered on the Internet. This will allow you the learner an alternative mode of study which may function as a supplement to your existing paper-based study material. Alternatively you may wish only to use the web-based training module.

- The web site will offer you the opportunity to access your study material at any time and anywhere.
- You will no longer be reliant on postal deliveries before you are able to start work on your projects and assessment activities.
- You will also have access to the latest copy of the subject content throughout the year.
- All the activities and dates concerning the degree will be available on the site and you will immediately be informed of any changes in rescheduling that may take place.

Procedure

This study will involve the completion of three (3) questionnaires.

1. The first questionnaire will be about your personal profile.
2. The second questionnaire will be about how you rate the training web site presented to you.
3. Third will ask you about your view on using both the printed study material and a web site for your studies.

What to expect

If you agree to participate, you will be required to complete the questionnaires; this should take approximately 20-30 minutes.

You will also need to evaluate a web site. There will be no further participation asked of you.

Risks

There are no risks involved in participating in this study.

Obligations

Participation is voluntary. Refusal to participate or deciding to discontinue participation at any time will involve no penalty or loss of benefits to which you are otherwise entitled. Refusal to participate will not affect your results or studies in any way.

There are no monetary incentives involved.

Confidentiality

The results of this study will be completely confidential. This study is for research purposes only.

Subjects' Rights

If you have any questions concerning your rights as a subject, please contact Leonie Steyn at Vista University Distance Education Campus, telephone number 012 352 4195.

Informed Consent

Please sign in the space provided below to indicate that you have received and understood the verbal and written explanation of the procedures and objectives of this study, and have had all your questions answered to your entire satisfaction.

I_____print name) have read the above explanation of the research project I am volunteering to participate in. I have had an opportunity to ask any questions about my participation, and all questions have been answered to my satisfaction. I recognise that my participation is voluntary and that I may withdraw at any time.

Participant's Signature _____   Date: _____

Witness's Signature   _____   Date: _____

Researcher's Signature _____   Date: _____

Appendix A   285

APPENDIX B

Questionnaire A: Learners profile

Questionnaire A

Learner profile

About this questionnaire

The purpose of this questionnaire is to help us gain an understanding of the learners who are enrolled for the BA (Hons) Degree: Social Behaviour Studies in HIV/AIDS, and to get feedback or comments about the degree.

We shall use this information to devise a programme that aims to meet the needs of the learners as far as possible.

- Please read the statements below.
- Mark the appropriate number in the shaded area with a cross (**X**), or where necessary, write your comment in the shaded area.
- There is no correct or incorrect answer.
- Try to respond to all the items.
- For items that are not applicable write **NA** in the top line of the appropriate table.
- Please add any comments you may have at the end of the questionnaire.

The table below is an **example** of how to complete the questionnaire.

Example

How old is the toddler?

Younger than 12 months	X
1 year	2
Two years	3
Older than two years	4

_____

Please mark the appropriate number with a cross (**X**) in the shaded area, or where necessary, write your answer in the shaded area.

Section A: Personal profile

1   What is your sex?

Male	1
Female	2
Other (Specify)	3

V3   ☐   4

2   How old were you on your last birthday?

_____ years

V4   ☐☐   5-6

3 What is your home language?

Afrikaans	1
English	2
Northern Sotho	3
Southern Sotho	4
Tswana	5
Venda	6
Xhosa	7
Zulu	8
Other (specify)	9

V5   ☐☐   7-8

4   What is your marital status?

Single	1
Married: Customary	2
Married: Civil	3
Separated/Divorced	4
Widowed	5
Other (Specify)	6

V6   ☐   9

5   In which province are you living at present?

Eastern Cape	1	V9	13
Western Cape	2		
Northen Cape	3		
Free State	4		
Gauteng	5		
KwaZulu Natal	6		
Limpopo (Northern Province)	7		
Mpumalanga	8		
North West Province	9		

6   What is your gross income per month?

R 1 000 or less	1	V10	14
R1 001 to R5 000	2		
R5 001 to R 10 000	3		
R10 001 or more	4		

Section B: Personal circumstances

7   In what kind of accommodation do you live?

Own house / flat	1	V13	17
Rented house / flat	2		
Rented room	3		
Room (share with relatives or friends)	4		
Hostel	5		
Temporary structure	6		
Other (specify)	7		

8   What source of lighting does your accommodation have?

Permanent electrical supply	1	V14	18
Electrical generator (220 volt)	2		
Battery power	3		
Cylinder gas	4		
Candles	5		
Other (specify)	6		

9 What is the **total** amount of time you spend travelling to and from work/university each day?

Less than fifteen minutes	1	V19	☐	23
Between fifteen and thirty minutes	2			
Between thirty minutes and an hour	3			
Between one and two hours	4			
More than two hours	5			
Not applicable	6			

10 What type of transport do you use regularly? (You may choose more than one option).

On foot	1	V20	☐	24
Bus	2	V21	☐	25
Train	3	V22	☐	26
Taxi	4	V23	☐	27
Own car	5	V24	☐	28
Other (specify)	6	V25	☐	29

Section C: Educational Background

11 What was your final school qualification?

Matriculation with exemption certificate	1	V26	☐	30
Senior Certificate (Without matriculation exemption)	2			
Grade 11 (Standard 9)	3			
Grade 10 (Standard 8)	4			
Other (specify)	5			

12 At what kind of institution did you complete your secondary education?

Government school	1	V27	☐	31
Private school	2			
Correspondence	3			
Adult education centre	4			
Other (specify)	5			

13 What was the average percentage you obtained in the
     final school examination?

70 - 100% (A + B aggregate)	1
60 - 69% (C aggregate)	2
50 - 59% (D aggregate)	3
40 - 49% (E aggregate)	4
33 - 39% (F aggregate)	5

V28 ☐ 32

Section D: Professional Background

14 Currently, in what profession are you?

Unemployed	1
Nursing	2
Teaching	3
NGO	4
Self employed	5
Other (specify)	6

V30 ☐☐ 35-36

15 How many years work experience do you have?

_____ years.

V31 ☐☐ 37-38

16 What is your most recently completed qualification?

Teaching diploma	1
Nursing diploma	2
B-degree	3
Honours degree	4
Masters degree	5
Other (specify)	6

V32 ☐ 39

17 In what year did you obtain the above qualification?

☐☐☐☐

V33 ☐☐ 40-41

18   In which demographic area are you working?

City (e.g. Pretoria, Welkom, Cape Town)	1	V34	42
Large town (e.g. Tzaneen, Rustenburg)	2		
Small town (e.g. Theunissen, Groblersdal)	3		
Rural area without a town in the immediate vicinity	4		

Section E: Study methods and personal circumstances

19   Are you experiencing any circumstances that could influence your studies negatively?

None	1	V42	51
Sometimes	2		
Some, but I am able to cope with them	3		
Yes, definitely	4		

20   How favourable is the situation at home, for you to study?

Practically impossible	1	V43	52
Fairly difficult	2		
Convenient	3		
Good	4		
Excellent	5		

21   Where do you do the most of your studying?

At the dining room / kitchen table	1	V44	53
In my bedroom	2		
At work	3		
At a friend's / relative's home	4		
In a study at home	5		
A library (other than my work place, e.g. public library, University library)	6		
Other (specify)	7		

22   Choose the option that best describes your study
     practices at present.

I memorise the content from my study material (e.g. study guide, text books).	1
I try to understand and apply the content from my study material.	2
I both memorise and try to apply the content of the study material.	3

V46 ☐ 55

23   Per week, I divide my time equally between all my
     modules.

Never	1
Sometimes	2
Always	3

V47 ☐ 56

24   How many hours per week on average, do you spend
     working at your studies?

_____ hours

V48 ☐☐ 57-58

25   What method of assessment do you prefer?

Being assessed by means of assessment activities and competency assessments	1
Writing tests during the semester and an examination after completing the module/course	2

V49 ☐ 59

26   How would you evaluate your level of competence in
     studying through the medium of English?

Excellent	1
Good	2
Satisfactory	3
Poor	4

V60 ☐ 70

Section G: Computer and Internet use

27   Do you have access to a computer to use for your
     studies?

Yes	1
No	2

V68 ☐ 78

28 Indicate which statement applies to you:

I view myself as computer literate	1
I have enough computer skills to help myself	2
I feel my computer skills are not adequate	3
I can not use a computer	4

V69   79

29 Do you have access to the Internet?

No	1
Yes, at work	2
Yes, at home	3
Yes, at home and work	4
Internet café	5
Friend's home	6
Other (Specify)	7

V70   80

30 I use the Internet: (you may choose more than one
    option).

Mainly for my studies	1
For recreation and relaxation	2
To obtain information regarding my work	3
Not applicable	4

V71   81
V72   82
V73   83
V74   83

31 Any comments:

_____

_____

_____

_____

V75   84
V76   85
V77   86

APPENDIX C

Questionnaire B: Formative evaluation of the training website

Questionnaire B

Formative evaluation of the training website

For office use

Respondent no:	V1		1-2
Repetition number:	V2		3

About this questionnaire

The purpose of this questionnaire is to help us gain an understanding of the learners who are enrolled for the BA (Hons) Degree: Social Behaviour Studies in HIV/AIDS, and to get feedback or comments about the degree.

We shall use this information to devise a programme that aims to meet the needs of the learners as far as possible.

- Please read the statements below.
- Score each statement by indicating how true the statement is for you, by placing an **X** over one of the numbers, 1 to 5 in the shaded areas.

- The scoring system is 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)

- Please note there is there is **no** correct or incorrect answer.
- Try to respond to all the items.
- For items that are not applicable use: **NA**
- Please add any comments you may have at the end of the questionnaire

The table below is an **example** of how to complete the questionnaire.

Example:

	TA	A	N	D	SD
The venue was at a good location	1	2	3	4	5
My seat was very comfortable	1	2	3	4	5
The lighting of the room was good	1	2	3	4	5

_____

Evaluation of the e-learning website

1 How did you experience the screen display of the website?

		TA	A	N	D	SD
a	I found the visual presentation excellent	1	2	3	4	5
b	The screens are too full and overcrowded	1	2	3	4	5
c	The screen displays distracted me	1	2	3	4	5
d	The sequence of the screens was very clear	1	2	3	4	5
e	The screen layout was good and easy to read	1	2	3	4	5
f	The organization of the information was **un**structured	1	2	3	4	5
g	I knew what each button, symbol and graphic on the screen meant	1	2	3	4	5
h	The positioning of information on the screen was **in**consistent	1	2	3	4	5
i	In each unit the assessment has the same screen layout. This helped me to know what was expected from me when completing the assessments	1	2	3	4	5

V3		4
V4		5
V5		6
V6		7
V7		8
V8		9
V9		10
V10		11
V11		12

2 How did you experience the **text** layout of the website?

		TA	A	N	D	SD
a	The characters on the screen were difficult to read	1	2	3	4	5
b	The font appearance was pleasing on the eye	1	2	3	4	5
c	The font size was readable and acceptable	1	2	3	4	5
d	I did not like the colour used for the text	1	2	3	4	5
e	The colour coding of the text was easy to understand	1	2	3	4	5
f	There is too much text on the screens	1	2	3	4	5

V12		13
V13		14
V14		15
V15		16
V16		17
V17		18

3 How did you experience the language and terminology of the website?

		TA	A	N	D	SD
a	The level of the language was too high and made it difficult to understand the content	1	2	3	4	5
b	Terminology was consistent throughout the course	1	2	3	4	5
c	The terminology always related to the task	1	2	3	4	5
d	Unfamiliar subject-related terminology was not explained	1	2	3	4	5
e	Prompts for input were always clear	1	2	3	4	5
f	The length of the sentences made the content easy to read and understand	1	2	3	4	5

V18		19
V19		20
V20		21
V21		22
V22		23
V23		24

4	How did you experience the graphics and colour of the website?

		TA	A	N	D	SD
a	The graphics are effective and make the content clear	1	2	3	4	5
b	The graphics distracted me and I could not concentrate on the content	1	2	3	4	5
c	The colours of the graphics were pleasing to look at	1	2	3	4	5
d	I would have preferred fewer graphics in the website	1	2	3	4	5
e	The colours used for the website (such as the background and buttons) were not pleasing to look at	1	2	3	4	5

V24 ☐ 25
V25 ☐ 26
V26 ☐ 27
V27 ☐ 28
V28 ☐ 29

5	How did you experience the content of the website?

		TA	A	N	D	SD
a	The content was clear and understandable	1	2	3	4	5
b	The content was too difficult	1	2	3	4	5
c	I was dissatisfied with the content	1	2	3	4	5
d	I found the activities in each unit useful	1	2	3	4	5
e	I found the assessment criteria after each unit helpful as a guide to what were expected from me when completing the assessments	1	2	3	4	5

V29 ☐ 30
V30 ☐ 31
V31 ☐ 32
V32 ☐ 33
V33 ☐ 34

6	How did you experience the navigation and interaction within the website?
	Navigation means going to other pages and finding things on the pages)

		TA	A	N	D	SD
a	The website was user friendly	1	2	3	4	5
b	I felt the website addressed me personally	1	2	3	4	5
c	The introduction did not explain the purpose of the website	1	2	3	4	5
d	The user instructions on how to use the website were clear and easy to follow	1	2	3	4	5
e	The navigation was unclear and inconsistent	1	2	3	4	5
f	I always knew where I was in the website	1	2	3	4	5
g	Directions on the website were unclear and difficult to follow	1	2	3	4	5
h	At times I was uncertain of what to do	1	2	3	4	5
i	I often got lost in the content	1	2	3	4	5
j	I knew what each icon/button meant and when to click on it	1	2	3	4	5
k	I found the option to make a printout of the screen useful	1	2	3	4	5

V34 ☐ 35
V35 ☐ 36
V36 ☐ 37
V37 ☐ 38
V38 ☐ 39
V39 ☐ 40
V40 ☐ 41
V41 ☐ 42
V42 ☐ 43
V43 ☐ 44
V44 ☐ 45

7   How did you experience the learning of the website

		TA	A	N	D	SD			
a	Learning to operate the website was difficult	1	2	3	4	5	V45		46
b	Exploring the features by trial and error was easy	1	2	3	4	5	V46		47
c	Remembering names and use of commands was easy	1	2	3	4	5	V47		48
d	Performing tasks was difficult	1	2	3	4	5	V48		49

8   Read the statements below and give your view on the website.

		TA	A	N	D	SD			
a	The website can help me to understand the subject content in my study guide better	1	2	3	4	5	V49		50
b	The various questions and activities in the website can assist me in under-standing the subject principles better	1	2	3	4	5	V50		51
c	Working through the website makes me more confident about answering my assessment questions better	1	2	3	4	5	V51		52

9   How did you experience the computerised format of the exercises?

		TA	A	N	D	SD			
a	I found it difficult to complete the exercises because of the computerised format	1	2	3	4	5	V52		53
b	I found the exercises easy to do	1	2	3	4	5	V53		54
c	I would prefer to do the exercises of the website in a pen-and-paper format	1	2	3	4	5	V54		55
d	The computerised format made the exercises more interesting than the equivalent pen-and-paper format	1	2	3	4	5	V55		56
e	In the exercises I found it difficult to click on an object and drag it to another position	1	2	3	4	5	V56		57

10   General statements

		TA	A	N	D	SD			
a	I feel the website enhanced and improved my skills	1	2	3	4	5	V57		58
b	I feel the website will not assist me in improving the quality of my work	1	2	3	4	5	V58		59
c	In general, the website made a good impression	1	2	3	4	5	V59		60
d	I will tell my friends positive things about the website	1	2	3	4	5	V60		61

11   List any positive or negative comments on the website or any
changes or improvements you would like to see.

V61	63-64
V60	65-66

APPENDIX D

Questionnaire C: Learners profile Summative evaluation of a mixture of media and technology training

Questionnaire C

Formative evaluation of the training website

For office use

Respondent no:	V1	1-2
Repetition number:	V2	3

About this questionnaire

The purpose of this questionnaire is to help us gain an understanding of the learners who are enrolled for the BA (Hons) Degree: Social Behaviour Studies in HIV/AIDS, and to get feedback or comments about the degree.

We shall use this information to devise a programme that aims to meet the needs of the learners as far as possible.

- Please read the statements below.
- Score each statement by indicating how true the statement is for you, by placing an **X** over one of the numbers in the shaded areas.
- Please note there is **no** correct or incorrect answer.
- Try to respond to all the items.
- For items that are not applicable use: **NA**
- Please add any comments you may have at the end of the questionnaire.

The table below is an **example** of how to complete the questionnaire

How old is the toddler?

Younger than 12 months	1
1 year	2
Two years	3
Older than two years	4

_____

Section A: Learner experience and views

1   How did you experience working with the website?

		TA	A	N	D	SD
a	I was impressed with the website	1	2	3	4	5
b	The website was challenging	1	2	3	4	5
c	The website was stimulating	1	2	3	4	5
d	I did not enjoy working with the website	1	2	3	4	5
e	The website was easy to use	1	2	3	4	5
f	The website frustrated me	1	2	3	4	5
g	I felt using the website was a waste of time	1	2	3	4	5

V3   4
V4   5
V5   6
V6   7
V7   8
V8   9
V9   10

2   What is your view on the website?

		TA	A	N	D	SD
a	I enjoyed working with the website	1	2	3	4	5
b	I think I would make use of a website when studying	1	2	3	4	5
c	The web-based content will help me to under-stand the printed study material better	1	2	3	4	5
d	I found the activities in each unit useful	1	2	3	4	5

V10   11
V11   12
V12   13
V13   14

Section B: E-mail communications and online study material

3   Do you use e-mail to communicate with your lecturer and fellow learners concerning your studies?

Never	1
Sometimes	2
Often	3

V14   15

4   Would you prefer to have your study guide and tutorial letter available online?

Yes	1
It does not matter	2
No, I prefer the printed format	3
It would be handy to have the study material in both printed format and on the Internet	4
It is unnecessary to have study material in both printed format and on the Internet	5

V15   16

5   Would you prefer to send your assessments activities via e-mail?

Yes	1
It does not matter	2
No, I prefer to post them	3
NO, I prefer to submit the assessments personally	4

V16 ☐ 17

6   Would you prefer to receive the marked assessments back via e-mail?

Yes	1
It does not matter	2
No, I prefer assessments be returned by post	3
No, I prefer to collect the marked assessments personally	4

V17 ☐ 18

Section C: Combination of a mixture of technologies and media

Please indicate with an **X** the appropriate number in the shaded area that best matches you opinion. (You may choose more than one option).

7   When studying:

I will only use my printed study material, such as my study guide, tutorial letters and prescribed textbooks	1
I will also use other reference sources in printed form (e.g. library books and journal articles)	2
I will use the Internet to gather information for my studies	3
I plan to communicate only via telephone, fax and mail with my lecturer and fellow learners	4
I use e-mail and telephone to communicate with my lecturer and fellow learners	5
I will only consult the lecturer in her/his office, I prefer not to use other means of communication	6

V18 ☐ 19

V19 ☐ 20

V20 ☐ 21

217 ☐ 22

V22 ☐ 23

V23 ☐ 24

8   Which of the following modes of communication would you prefer to use?

Printed study material	1	V24		24
Printed activities and assessments	2	V25		26
Contact sessions	3	V26		27
Telephone and fax	4	V27		28
E-mail	5	V28		29
Online discussion groups	6	V29		30
Online study guides and tutorial letters	7	V30		31
Online self-assessment	8	V31		32

9   Would you prefer to receive instruction through a combination of media and technology?

No	1	V32		33
Maybe	2			
Absolutely	3			

10   Which of the following formats would you prefer to have available for instruction?
(You may choose more than one option)

E-learning	1	V33		34
Video-conferencing	2	V34		35
Television broadcasts	3	V35		36
Radio broadcasts	4	V36		37

Thank you for your participation and co-operation !

APPENDIX E

Think aloud activities

Think aloud activities

1   Find the general information page.

2   Find the introduction of unit one.

3   Find information on the discussion forum under the resourses.

4   Go to lesson 5 of unit one and open the daily food guide.

5   Go to the quizzes of unit 6 and complete them.

6   Go to the assessment activities of unit 1.

7   Open the PDF document on the national guidelines on nutrition for people living with HIV and AIDS.

8   Go to the guidelines for submitting assessment activity one.

9   Find the formative assessment activities of unit 6

10 Find the formative assessment activity of the course and explain what you need to do.