# 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

> **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:<br>• video and audio tapes<br>• video and audio conferencing<br>• electronic collaboration tools<br>• radio and television programmes<br>• CD-ROMs<br>• online and other web-based learning<br>• other computer-based learning resources<br>• 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:<br>• synchronously – in real-time in a classroom or in a distance situation<br>• 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:<br>• high levels of interactivity<br>• the possibility of personalizing learning material<br>• 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.<br><br>Synchronous – delivery of instructional elements | Learners set their own pace and direction. Other users need to be online at the same time.<br><br>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)?<br>• If not, how many learners do have their own PCs?<br>• If a learner does not have a PC, does he or she have access to a PC?<br>• How many learners do not have access to PCs?<br>• 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?<br> - Turn on (boot) the PC<br> - Start programs using Windows<br> - Type input using a keyboard<br> - Use a mouse<br> - 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?<br>• How do learners feel about online learning?<br>• How many feel positive and keen about online learning?<br>• How many learners feel intimidated by technology? |
| Learning environment | • Does the learning environment enhance or obstruct learning?<br>• How much interruption (cellular phones, the Internet, and other sources) are learners going to be exposed to?<br>• How likely will learners be to respond to interruptions?<br>• How much privacy will the location allow the learners to have?<br>• Is the available physical space adequate for using other materials? |
| Subject matter | • Can the subject matter accommodate e-learning?<br>• Is the design team involved in the development of subject matter features that are executed with the computer?<br>• Are there options for integrated learning resources and the computer? |
| Study material | • Do learners have the means and facilities to access the study material?<br>• 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.<br>• What is the impact of distance learning on learners? Do learners feel lonely and unconnected? |
| Pedagogy and the www | • How much information is given?<br>• 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?<br>- a minimum operating system (Windows 98)<br>- minimum disk storage (18.6 Giga byte)<br>- a minimum main memory (256 kB)<br>- installed office applications (such as MS Office)<br>- other standard applications<br>- a web browser (type, level, supported or not)<br>- a sound card<br>- a CD Rom drive<br>Printer access which is:<br>- attached to the PC<br>- on a LAN within the facility<br>- 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?<br>Has the organisation chosen software for:<br>- authoring content? (If *yes*, which software?)<br>- synchronous communications? (If *yes*, which software?)<br>- asynchronous communications? (If *yes*, which software?)<br>- preparing graphics? (If *yes*, which software?)<br>- preparing animations? (If *yes*, which software?) |
| Additional questions about technology infrastructure | How frequently are PCs replaced?<br>Does bandwidth accommodate demand?<br>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

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**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?

</div>

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:<br>• discovering their mental models and expectations.<br>• including learners as part of the design/development process. Observing learners in their natural surroundings while analysing their tasks, workflow, and goals.<br>• 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:<br>• computer and Internet access and literacy.<br>• how much computer training (if any) they have or will receive.<br>• their working and web-surfing environments.<br>• their hardware, software, and browsers.<br>• what they need and expect from the education website.<br>• background knowledge concerning the subject matter.<br>• their preferred learning styles.<br>• 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.<br>• their cultural issues.<br>• 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:<br>• What are the tasks that learners need to perform?<br>• How do they currently perform these tasks?<br>• What is the workflow when they perform these tasks?<br>• Why do learners perform their tasks in the way that they do?<br>• What are the learners' information needs?<br>• How do learners discover and correct errors?<br>• 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.<br>• Conduct usability testing throughout the development cycle.<br>• Usability testing can be conducted in usability laboratories or in relatively simple and inexpensive surroundings such in an office or at a workstation.<br>• 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**<br>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.<br>Present information such as headings, images and colour consistently, and use same sequence of actions across similar conditions throughout the site.<br>Use standard naming conventions.<br>Terminology should be consistent between screens.<br>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**<br>Do not compromise usability for function | Maintain a simple and straightforward interface.<br>Make functions easily accessible and usable.<br>Break complex tasks into simpler tasks.<br>Keep tasks easy by using familiar icons/objects, words etc. |
| **Navigation**<br>Arrange navigation options uniformly | Provide navigational aids at the top and/or bottom of each page.<br>Web pages should provide clear cues to the context and organization of the information.<br>Make sure that recurring text or buttons appear in the same place on different pages.<br>Limit scrolling; aim at keeping pages as short as possible.<br>Design to a maximum of three navigational depths. Limit learner confusion and disorientation.<br>Make sure learners can find what they are looking for by providing:<br>• clear, consistent icons<br>• graphic or text based overviews and summary screens<br>• clear navigation between screens.<br>• Learners should be able to return to the home page and other important navigation points easily.<br>• 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.<br>• Maintain display inertia. Make sure that the screen changes little from one screen to the next within a functional task situation.<br>• Eliminate unnecessary information.<br>• Keep important information at the top of the page.<br>• Use "white space" to visually organize pages, to make important elements stand out.<br>• Group information logically. Structure information rather than just present a narrative format. Comprehension is faster from a structured format.<br>• Animated items can enhance visual satisfaction as long as they are functional and do not interfere with the learning process. |
| Legibility | **Font**<br>• On text screens, don't use more than three to four fonts on a screen.<br>• Experiment with font size and bolding to achieve desired legibility for Different content items or screens.<br>• Sans serif fonts are usually easier to read online than serif fonts<br>• Ornamental fonts and italics are difficult to read online.<br>• 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.)<br>**Text**<br>• It is difficult to read text that is all in uppercase letters. Use a mix of uppercase and lowercase letters.<br>• Blocks of text longer than 50+ characters significantly slow reading.<br>• Dark text against a light background is most legible. |
| Clarity of language | To foster clarity, use:<br>• short, simple sentence structures.<br>• everyday words (instead of jargon or technical terms).<br>• the active voice rather than the passive voice for verbs.<br>• concise, unambiguous wording for instructions and messages.<br>• Developers should consider crossing cultural and national boundaries. Consider ambiguity in the form of:<br>humour. (Humour does **not** translate well across cultures: at best, it is not understood, at worst, it can offend.)<br>metaphors. (Different interpretation of metaphors across cultures can create problems.)<br>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).<br>• Use meaningful icons and letters.<br>• Use "real-world" metaphors whenever possible (e.g. desktop metaphor, folder metaphor, trash can metaphor, etc.) |
| Memory load | • Reduce learners memory load by:<br>  - organising information into a small number of "chunks".<br>  - limiting the length of sequences and quantity of information.<br>  - 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.<br>• Learners should recognise rather than recall information.<br>• 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.).<br>•  Maximise attention. Maintain learner focus by introducing anticipation.<br>• 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.<br>• Use colours appropriately and make use of cultural expectations and assumptions. Consider one colour for headings on home page and unit home pages.<br>• Use only two levels of colour intensity on a single screen.<br>• The use of a second colour could enhance usability when it is combined with bolding to emphasise key words, terms, etc.<br>• 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.<br>• 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.<br>• 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.<br>• 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:<br>- Make links sufficiently descriptive so that learners can easily predict what they will find when they click a particular link<br>- Learners should be able to visualise the site's structure.<br>- 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.<br>• Check for scripting errors and whether links are current. |
| Recovery from errors | • Help learners to recognise, diagnose, and recover from errors.<br>• 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.<br>• Keep web pages, graphics, and downloaded files to a reasonable size.<br>• 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:<br>• perception of ease-of-use<br>• motivation for learning how to use the site<br>• confidence in the reliability of the site's information |
| Accessibility | Assist learners to find information quickly and easily by:<br>• clearly indicating to learners where they are situated within the broader context of an learning website.<br>• clearly naming links.<br>• 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.<br>• "chunking" material. A key to good instructional design is to *chunk* material into small workable sections that can be accessed easily quickly.<br>• 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.<br>• Support skimming by:<br>  - structuring content with two or three levels of headings.<br>  - using clear, meaningful headings.<br>• 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 assess-ments, 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.<br>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<br>• Ease of navigation through appropriate structures<br>• Ability to get an overview of site structure | • Navigation problems<br>• Users get lost easily |
| Content | • Useful information<br>• Current information<br>• Concise, non-repetitive information<br>• Information not easily or readily found in library collections | • Superficial information<br>• Uninformative content<br>• Advertisements<br>• Repetitious content<br>• Boring text<br>• Lack of current information |
| Structure | • Well organised<br>• Intelligible<br>• Straightforward<br>• Mediated through text that is broken up into accessible units (chunking)<br>• Innovative in presentation and organisation | • Contains text that is too long<br>• Divided into confusingly labelled subsections |
| Linkage | • Linked to pages/sites that provide relevant information<br>• Ability to switch back and forth between topics | • Broken links<br>• Linked to sites/pages that are marked "under construction" |
| Search | • Search support<br>• Search provides a list of helpful sites or pages<br>• Minimum processing time to deliver | |
| Appearance | • Visually attractive<br>• Printable – without too many overly-darkened areas<br>• 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.<br>• Behaviour is determined by outcomes/consequences.<br>• Knowledge is manifested in behaviour (correct answers). | • The learner is an active processor of information (the computer-based model).<br>• The emphasis is on internal mental states.<br>• The perspectives, experience, knowledge and interests of the learners are regarded as being of critical importance. |
| Method | • Present content.<br>• Put questions to learners.<br>• Tell the learner if answer is correct or not.<br>• Positively reinforce correct answers.<br>• Repeat the cycle when answers are incorrect. | • Encourage knowledge formation.<br>• Recognise that the process will be different for each learner.<br>• Encourage self-directed exploration.<br>• Encourage discovery learning.<br>• Encourage the learner to construct concepts, schemas and mental models. |
| Approach | • Authoritative truths and knowledge are supplied for learners to memorise.<br>• The teacher controls the process.<br>• The learner learns (adopts) the authoritative meaning. | • Truth and knowledge is constructed by learners on the basis of their perspective and experience.<br>• The facilitator observes, and only coaches and facilitates if he or she is required to do so (i.e. when the learner needs help).<br>• 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.<br><br>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.<br><br>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:<br>• Gaining attention (reception)<br>• Informing learners of the objective (expectancy)<br>• Stimulating recall of prior learning (retrieval)<br>• Presenting the stimulus (selective perception)<br>• Providing learning guidance (semantic encoding)<br>• Eliciting performance (responding)<br>• Providing feedback (reinforcement)<br>• Assessing performance (retrieval)<br>• 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:<br>Learning hierarchies define a sequence of instruction.<br>Learning hierarchies define what intellectual skills need to be learned.<br>Different instruction is required for different learning outcomes.<br>***Example***<br>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.<br><u>Instructional objective</u><br>The treatment of nutrition-related symptoms of HIV and AIDS<br><u>Methodology</u><br>**Gain attention** – **List** nutritional related symptoms.<br>**Identify objective by posing a question** – "What advice can you give to a person suffering from these nutrition related symptoms?"<br>**Recall prior learning** – Review disease background and causes of symptoms.<br>**Present stimulus** – Ask them what they will do when they are confronted by the symptoms.<br>**Elicit performance** – Ask learners to provide nutritional advice related to the symptoms.<br>**Provide feedback** – Check whether the examples are correct or incorrect.<br>**Assess performance** – Provide scores and remediation.<br>**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.<br>Use Bloom's "Taxonomy of Educational Objectives for the Cognitive Domain" to increase retention.<br>Bloom outlines the following cognitive activities (an example from the topic is included with each one):<br>**Knowledge**: Know enough about food to identify the nutrients provided by the various foods groups.<br>**Comprehension**: Identify the nutrients provided by one food group and distinguish it from other food groups and what they provide.<br>**Application**: Eat certain foods to provide specific nutrients.<br>**Analysis**: Determine what food should be eaten by PLWHA.<br>**Synthesis**: Compare the nutritional needs for the different stages of HIV and AIDS.<br>**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:<br>• All learning activities should be meaningful and self-contained.<br>• Activities should exploit the learner's prior experience and knowledge.<br>• Learners should be given realistic projects as soon as appropriately possible.<br>• Instruction should permit self-directed reasoning and improvisation.<br>• Training materials and activities should provide for error recognition and should use errors as learning opportunities.<br>• 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".<br><br>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.<br>Minimise the amount of reading and other passive forms of training by allowing users to fill in the gaps themselves.<br>Include error recognition and recovery activities in the instruction.<br>Make all learning activities self-contained and independent of sequence.<br>Make sure that important information is at the top of the web page, so learners don't have to scroll too much.<br>Web-design should minimize the extent to which instructional materials obstruct learning.<br>Text design, graphics and sound should be simple and consistent. This will prevent cognitive overload.<br>Web pages must not be "cluttered", and they should download in 30 seconds or less.<br>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.<br>Limit cognitive overload, and be consistent in design of text, graphics and sound.<br>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.<br>Keep the following points in mind when designing e-learning courses:<br>Design small. Make what you have effective, and then add to it. Don't attempt to do everything at once.<br>Keep effects simple. Ensure that effects add to the message/content.<br>Map out the *whole* site (both for development and maintenance).<br>Plan for growth. Anticipate and direct it.<br>Get feedback from users.<br>Test any outside links regularly.<br>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:<br>• advance organiser phase<br>• modelling phase<br>• exploring phase<br>• generating phase<br><br>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).<br>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:<br>Full cognitive development requires social interaction.<br>Cognitive development is limited to a certain range at any given age.<br>**Application**<br>"The interactive nature of frames in interdisciplinary instructional design has the potential of implementing cognitive theories as its theoretical foundation" (Gillani & Relan, 1997:232).<br>The following model that contains four distinct web page frames is proposed:<br>**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.<br>**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.<br>**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.<br>**The Presentation Frame –** This is the main central frame. It displays whatever dynamic instructional content has been selected from the navigation frame. | Simplify navigation.<br>Create effective menus.<br>Clearly identify content with appropriate headings and titles.<br>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<br>• Study guides<br>• Readings<br>• Assignments, both written and printed<br>• Prescribed and recommended text books and literature | • Random access<br>• Portable<br>• Convenient to read, study and notate<br>• Multiple copies available<br>• Content is reliable and edited<br>• Individual or group use<br>• Includes a variety of resource material | • Bulky to store<br>• Information limited by page space<br>• Expensive to revise<br>• Can become outdated<br>• Fixed content that cannot respond quickly to sudden changes<br>• Physical distribution can be slow, difficult, or fail<br>• Delayed feedback |
| • Telecommunication-based<br>• Video-conferencing | • Enables real-time interaction among learners and educators in different locations<br>• Used for presentations, teaching sessions, discussions, learner support<br>• Can make scarce expertise widely available | • Has high start-up costs<br>• Requires technical support<br>• Requires learners to travel to a venue<br>• The added costs of providing a visual dimension may not provide matching benefits over audio-alone |
| • Telecommunication-based<br>• Telephone<br>• Facsimile | • Easy to use<br>• Most people have one or have access to one<br>• Immediate feedback | • Long distance and duration can be costly<br>• Requires technical support<br>• |
| • Internet | • Easy to use<br>• Interactive<br>• Immediate feedback | • Not every one has access<br>• Duration can be costly<br>• Requires training for effective use<br>• Requires technical support<br>• Hardware-intensive<br>• Infrastructure-intensive |
| • Audio-visual-based<br>• Video<br>• Film | • Demonstrates and explains processes well<br>• Broadcasting can be cost effective for large groups or multiple locations<br>• Can provide close analysis of separate segments of different parts of the materials<br>• Can support active learning with good instructional design | • Portable: requires bulky equipment<br>• Requires large storage space<br>• Information limited by time format<br>• Not indexable or searchable<br>• Difficult to actually *study* a tape<br>• High production costs<br>• Always vulnerable to the risks of technical malfunction |
| • Audio-based<br>• Audio-cassette tapes<br>• CD Audio | • Illustrations through sound<br>• Offers a permanent resource for individuals or groups<br>• Portable<br>• Cassette players are usually widely accessible<br>• Can be re-played, stopped and started at will<br>• Inexpensive to develop and duplicate<br>• Tutors can give feedback | • Audio-cassettes deteriorate over time and/or with extensive use<br>• Sound quality can be poor<br>• Cassettes need good management<br>• Can fail to stimulate active learning if they are used only to deliver lectures<br>• Requires skilled integration with other media<br>• 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<br>• Compact disk (CD)<br>• DVD disk<br>• Micro floppy disk<br>• | • Provides access to information that can be conveyed by text, graphics, or in audio and video formats<br>• Publishes logical "chunks" of information<br>• Scales well: can be used for a group presentation or for self-paced learning<br>• Repeatable and searchable<br>• Large amounts of information can be stored on one disk<br>• Cheap and simple to copy and distribute | • Disk portable but need computer to access<br>• Reading from a screen for some period can be difficult and tiring<br>• Learners may need training before use |
| • WWW- based<br>• E-mail<br>• Internet<br>• Online documentation<br>• Web-based training<br>• Intranet training<br>• Online help | • Provides a wide range of multimedia materials<br>• Supports formal to informal interaction<br>• Allows learners to participate in a large group<br>• Permits the exchange of experience and materials<br>• Unlimited access to information and assistance<br>• Provides logical chunks of information<br>• May be used for self-paced learning<br>• Repeatable and searchable<br>• Little storage space required | • Not always portable: Internet connection is required. Currently changing as wireless networks proliferate<br>• Complex authoring stage. Some learning curve for the end user<br>• Problems of access and cost<br>• Requires a viable and adequate infrastructure<br>• Requires change in teaching and learning perceptions and practices<br>• Printing lengthy amounts of downloaded text becomes costly<br>• Requires training for effective use<br>• Requires technical support<br>• The quality of learning programmes is sometimes poor |
| Visual-based<br>• Graphs<br>• Graphics<br>• Photographs<br>• Transparencies | • Enhance explanation<br>• Accommodate visual learning styles | • A computer may not be powerful enough to download the visuals<br>• Limited bandwidth increases downloading time<br>• Productions may not be functional (only decorative) |
| Human-based<br>• Lecturer<br>• Facilitator<br>• 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.<br>• Interactive<br>• Possibility of immediate feedback | • As a medium, it relies mostly on the skill of the lecturer<br>• Learners have little control over the pace of the lecture<br>• A lecture does nothing to enhance the learners' practical experience<br>• 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.