Chapter 1

Introduction

1.1 Introduction

Worldwide, there is a shift away from traditional learning towards open learning. The aim of open learning is to provide unhindered access to learning resources, so that technologically supported freedom of information may be turned into freedom of education for people pursuing their own learning needs (Virtual Campus, 1998a). The way to achieve this is through a flexible learning system.

A flexible learning system encompasses a range of distance and face-to-face delivery mechanisms and support systems, using appropriate, cost-effective combinations of technologies. In the context of such tendencies, universities and schools are increasingly making use of Internet and web-based technologies, telematic education, and web-based course management systems, using some of these technologies successfully and others less so.

This dissertation reports on an investigation into three asynchronous web-based technologies to determine their usefulness and the extent to which they support learning. The study comprises three case studies, each examining a separate web-based technology, suitable for diverse groups of learners in terms of age groups and backgrounds. In each case study, the research questions are subdivided into various aspects related to web-based learning, namely pedagogical, affective/emotional, communicative and technological aspects. The way in which these aspects are designed and implemented determines the usefulness of web-based technologies.

1.2 Research problem

There are numerous web-based technologies currently available, each with different applications. There is, however, no systematised structure stating which should be used for whom, and how the technologies should be used. This research attempts to describe the possibilities of web-based technologies for different age groups of learners (children, undergraduates and postgraduates), and types of teaching (contact teaching and distance learning).

1.3 Aim of research

The purpose of this study is to determine for whom and how these technologies could be used, with the intention of providing a systematic structure of web-learning possibilities for different learners and types of teaching. Educators and trainers can use this structure as a point of departure in future teaching experiences.

1.4 Objectives of the research

The specific objectives of the research are to assess:

- The usefulness of specific web-based technologies, as they relate to the four main aspects investigated in this study, namely:
  - Pedagogical/andragogical;
  - affective/emotional;
  - communicative; and
  - technological.
- The extent to which learners' responses to various web-based technologies vary between different groups of learners.

1.5 Research questions

The major research questions to be explored in this study are given in Table 1.1.

Table 1.1 Major research questions

1. What role do the following aspects play in web-based technologies:
   - Pedagogical/andragogical;
   - affective/emotional;
   - communicative; and
   - technological aspects?
2. What are the distinguishing characteristics of learners of different age groups, and what are the differences and similarities between these age groups in the context of web-based technologies?
3. What are the learning possibilities for:
   - Children;
   - undergraduates; and
   - postgraduates

   in the context of web-based technologies?
4. What are the web-learning possibilities for:
   - Contact teaching; and
   - distance learning?

These questions will be answered by investigating three case studies. In each case study, the target population is divided into two groups, for the purpose of comparison and contrast. Although the tendency is to use the generic term "learner", for the sake of clarity and to increase readability, the terms "**children**", "**undergraduates**" and "**postgraduates**" will also be used. When a combination of any of these terms is used, the word "learner" is used.

The target populations of the three case studies are discussed below.

Case Study 1: An investigation of *Plane Math* (a web-based tutorial and practice environment). The target population is primary school children and the investigation was performed in two different schools, one in an urban city context and the other in a rural town context.

Case Study 2: An investigation of a web-based course management system (CMS)

delivered by *WebCT*. The target population is tertiary-level learners, and the investigation was performed on a group of undergraduate Multimedia learners doing their Bachelor of Arts in Multimedia, and a group of postgraduate Engineering learners (adult learners) doing their Masters in Engineering. Both groups were using *WebCT* for the first time shortly after it was implemented by the Virtual Campus of the University of Pretoria. The investigation is therefore performed on groups of learners from both kinds of sciences, i.e. the "soft" and the "hard" respectively.

Case Study 3: An investigation of *RBO*, a fully online postgraduate course presented via a web-based classroom. The target population is tertiary-level adult learners. The investigation was performed on learners doing the course on a formal basis (i.e. as part of the Masters degree in Computer-Integrated Education (CIE)), and learners who did the course on an informal basis (i.e. in a continuing-education context).

In each case study the following aspects are considered:

- Pedagogical/andragogical aspects;
- affective/emotional aspects;
- communicative aspects; and
- technological aspects.

Figure 1.1 gives an overview of the study, showing the aspects investigated in each case study. The case studies are divided, in turn, into their constituent target populations. The web-based technologies under investigation employed different types of teaching, the educational web site being used in a physical classroom, while the web-based CMS was used to augment contact. The web-based classroom ran entirely on the Web with no physical contact.

Figure 1.1 Overview of the study

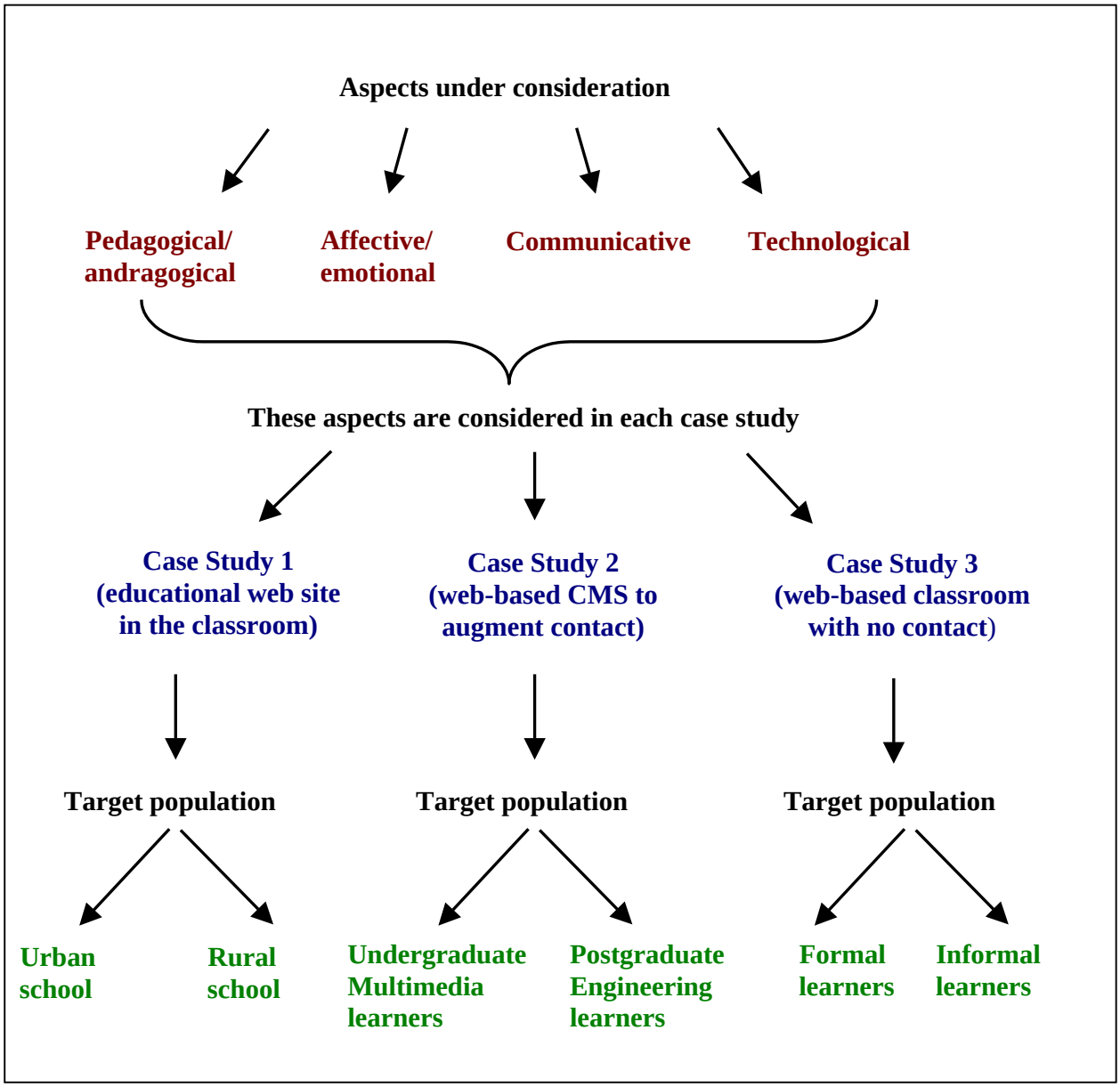


Table 1.2 gives the subquestions that arise in each case study, as they relate to the various aspects under investigation.

Table 1.2 Subquestions relating to the aspects under investigation in the various case studies

Case study	Aspects	Research subquestions
Case Study 1	Pedagogical	▪ What was the response of the children with regard to their own learning? ▪ How relevant is *Plane Math* to the school curriculum?
	Affective/emotional	▪ Did the children enjoy their learning experience?
	Communicative	▪ To what extent does the site employ adequate Instructional Design (ID) principles? ▪ To what extent does the Human-Computer Interaction (HCI) promote learning or hinder it?
	Technological	▪ To what extent does the technology support effective use?
Case Study 2	Andragogical	▪ To what extent is *WebCT* an aid/obstacle to learners' learning? ▪ Were learners satisfied with the nature of the feedback they received from their instructors via *WebCT*? ▪ To what extent can collaborative learning be stimulated effectively on *WebCT*, using the bulletin board feature?
	Affective/emotional	▪ What are learners' first impressions of *WebCT*? ▪ What emotions, likes and dislikes do learners experience when using *WebCT*?
	Communicative	▪ To what extent is *WebCT* user-friendly? ▪ To what extent is *WebCT* an effective means of delivery? ▪ What method of communication (face-to face/virtual) do learners prefer? ▪ To what extent do learners value a bulletin board?
	Technological	▪ What technological problems did learners/instructors encounter when using *WebCT*?
Case Study 3	Andragogical	▪ To what extent was the course, with no face-to-face contact, effective in supporting the needs and learning of postgraduate learners? ▪ To what extent can collaborative learning be effectively stimulated on the Internet?
	Affective/emotional	▪ What emotions, likes and dislikes do postgraduates learners experience in a fully online course?
	Communicative	▪ How effective was the design of the web-based material in facilitating learning? ▪ What features characterised the human-human interaction?
	Technological	▪ What technological problems are encountered in a fully online course?

The rationale behind investigating each of these cases will now be discussed.

Rationale for Case Study 1

The rationale behind this case study is to determine where web-based technologies can be used to supplement traditional contact teaching, and to conduct research on the effectiveness of educational web sites. The field of web-tutorials is a rapidly growing and dynamic one that is making a significant demand on evaluators to keep pace. Due to their currency, few have been evaluated thus far. If the feedback generated by such an evaluation is positive, it would be worthwhile to introduce web sites/tutorials as supportive tools in the appropriate educational curricula. Such information would be useful for instructional designers and educators as a way of evaluating the usefulness of children's web sites for enhancement or modification, and in the development of new web sites.

The purpose of taking a sample group from each of two schools in two different contexts is to see whether responses to the *Plane Math* web site varied, and to evaluate whether or not educational equality was achieved among diverse populations of learners.

Rationale for Case Study 2

The rationale behind investigating *WebCT* is to determine learners' responses to web-based CMSs. A further purpose is to investigate whether or not the interface of *WebCT* is intuitive and appropriate, and whether or not learners were challenged and engaged by the learning experience. It is also necessary to discuss the problems related to the development and implementation of courses of this kind, in order to avoid potential pitfalls.

WebCT was designed with a view to supporting interactive educational communication and to offering enhanced support to teachers and learners in using the Internet as a medium for learning. However, the true test of such a tool, apart from its contribution to learning outcomes, is the actual use to which it is put, the development of skills and method that it supports and the satisfaction learners gain from using it.

Rationale for Case Study 3

This case study investigates the extent to which one can work solely on the Internet and the Web. This issue is of particular significance as Internet-based learning is increasingly attractive for adults who work full-time but seek continuous education, and many adult learners attempt to achieve their goal of adult learning via distance learning options (Chyung, 1999). It also seeks to examine the extent to which collaborative learning can be stimulated on the Internet, with no face-to-face contact.

In Case Studies 1 and 2 the Web acts as a supplement to traditional contact teaching, while Case Study 3 reports on a fully online course.

1.6 Previous research

In order to place this research project in the context of research conducted in South Africa, a review of the NEXUS database was undertaken. According to this review, conducted in November 2000, eight related studies were identified. These are detailed in Table 1.3 and show the context of the problem, with regard to the existing body of literature.

Table 1.3 Related research topics

Researcher	Title	Year	Degree
Brown, S	A framework for internet-supported collaborative learning in South Africa	1998	MTech
Butcher, N and Roberts, N	The Internet, satellite and the professional development of educators: building appropriate teaching and learning models	1998	Non-qualification
Clarke, P.A	Telematic teaching of adults via the World Wide Web: a case study	1998	MEd
de Bruyn, A.M	Guidelines for the use of the Internet in teaching	1999	D Ed
de Jager, A	The use of the Internet as a constructivistic tool when teaching the mole concept	1995	MEd
Dickson, M	Superhighway or cul de sac: the Internet as a tool for learning school mathematics	1998	MEd
Peté, M.M	The design and development of a resource-based, open learning system on the World Wide Web	1998	MEd
Voster, B	Possibilities and constraints of teaching adults on the World Wide Web.	1998	MEd

From Table 1.3 it can be seen that this research is relevant to research conducted by the authors de Bruyn, Peté and Voster, but at the same time it is unique, because it seeks primarily to investigate learners' responses to web-based technologies and, based on these responses, propose the way forward. The study is also highly integrated in that it investigates three case studies, where web-based technologies are investigated on learners from various age groups, giving a wide picture of for whom and how web-based technologies can be used to support learning. The research is thus both relevant and unique.

1.7 Value of research

Kinshuk (2000) comments:

> *Rather than jump from one technology fad to another or leap to conclusions that new technologies require new planning and design processes or radically different learning paradigms, it appears reasonable to consolidate what we know works best in which various learning and work environments, and to identify known gaps in our knowledge and areas where new technologies simply do not fit well into existing frameworks.*

The main contribution the dissertation will make to research is to provide educators with possibilities for using web-based technologies for learners of different ages (children, undergraduates and postgraduates) and for different types of teaching (contact teaching and distance learning). Its ultimate purpose is to

expand educators' abilities to provide effective training and education via these media, so as to attain greater success in future teaching experiences.

1.8 Methodology

The research design for both the proposed study and the separate case studies is discussed in this section, as well as the data collection methods used. An evaluation matrix is presented in Table 1.5, which correlates the major research questions with the main research methods used in each case study.

1.8.1 Research design

The study commences with a literature review on the fundamentals of web-based technologies. Three case studies were undertaken to illustrate how theory derived from the literature is applied in practice. The overall research design is eclectic, as separate research designs were used in each case study.

The study follows an opportunist model, in that the researcher used the events that came her way and which were available to her to test the success of various web-based technologies.

The individual case studies follow similar research designs, in that each case study follows a quantitative non-experimental survey design. In such designs, data is collected through questionnaires/interviews and statistically analysed (McMillan and Schumacher, 1993). According to McMillan and Schumacher (1993), designs of this nature have a wide range of applications.

Due to the small group sizes in each case study, statistical analysis of the data has not been conducted, as this would have little value. Consequently the results from each case study provide only initial support. Case Studies 2 and 3 rely on a combination of two research designs, namely, a quantitative non-experimental survey design and a qualitative ethnographic design. A qualitative ethnographic design relies on observation and interviews to gain an in-depth understanding of the situation at hand, and relies on rich descriptions of data (McMillan and Schumacher, 1993).
The researcher intends to discover, through both qualitative and quantitative research, how learners of different age groups respond to and experience different web-based technologies, and whether or not these technologies support learning.

1.8.2 Data collection methods

Table 1.4 shows the various data collection methods used in the individual case studies.

Table 1.4 Data collection methods

Case studies	Data collection methods
Case Study 1	Questionnaire, observation, expert review checklist
Case Study 2	Questionnaire, interviews, analysis of messages sent to the bulletin board
Case Study 3	Questionnaire, participant observation, interviews, analysis of messages sent to the discussion list

In Case Study 1, data was collected primarily by means of a questionnaire, but also by using observation and an expert review checklist. In Case Study 2, a questionnaire was once again the primary data collection method. Other data collection methods used were interviews with the two instructors responsible for using *WebCT* in their courses, as well as an analysis of the messages sent to the bulletin board. The data collection methods used in Case Study 3 were similar to those used in Case Study 2, except that participant observation was also used. The methods used in Case Study 3 were a questionnaire, participant observation and interviews, as well as an analysis of the messages sent to the discussion list. Multiple methodologies were used in each case study to validate the results generated from the questionnaire, i.e. to apply triangulation.

The various data collection methods are elaborated on in the context of the three case studies, as given in Chapters 3, 4 and 5 respectively. The results derived from each case study will be integrated in Chapter 6, in order to answer the main research questions.

Reeves (in: de Lisle, 1997) recommends an evaluation matrix for research into multimedia. Table 1.5 presents such a matrix which, in this instance, correlates the major research questions with the main research methods implemented in each case study.

Table 1.5 Matrix of research questions and methods

Method / Questions	Case Studies	Literature review	Question-naires	Interviews	Observation	Analysis of messages
What role do pedagogical/ andragogical, affective/emotional, communicative and technological aspects play in web-based technologies?	1	✓	✓			
	2	✓	✓	✓	✓	✓
	3	✓	✓		✓	✓
What are the distinguishing characteristics of learners of different age groups, and what are the differences and similarities between these age groups in the context of web-based technologies?	1	✓	✓		✓	
	2	✓	✓			✓
	3	✓	✓		✓	✓
What are the learning possibilities for children, undergraduates and postgraduates in the context of web-based technologies?	1	✓	✓		✓	
	2	✓	✓		✓	
	3	✓	✓	✓	✓	✓
What are the web-learning possibilities for contact teaching and distance learning?	1	✓	✓		✓	
	2	✓	✓	✓		✓
	3	✓	✓	✓	✓	✓

1.9 Limitations of this study

Certain limitations were experienced in the study, namely:

- Limited time available for the investigation;
- the studies dealt with small segments of subject areas; and
- small group sizes are used.

The small group sizes mean that while there were some commonalities among learners, these findings are not generalisable. Consequently, the results from each case study provide only initial support.

1.10 Specific exclusion from this study

The researcher accepts Clark's contention that media do not influence learning (Clark, 1994), and Russell's conclusion that there are no significant differences in performance between individual delivery media (Russell, 1999). The researcher will therefore not be measuring learning gain through pre-tests (before the training), and post-tests alike (after training), to determine the extent of learning.

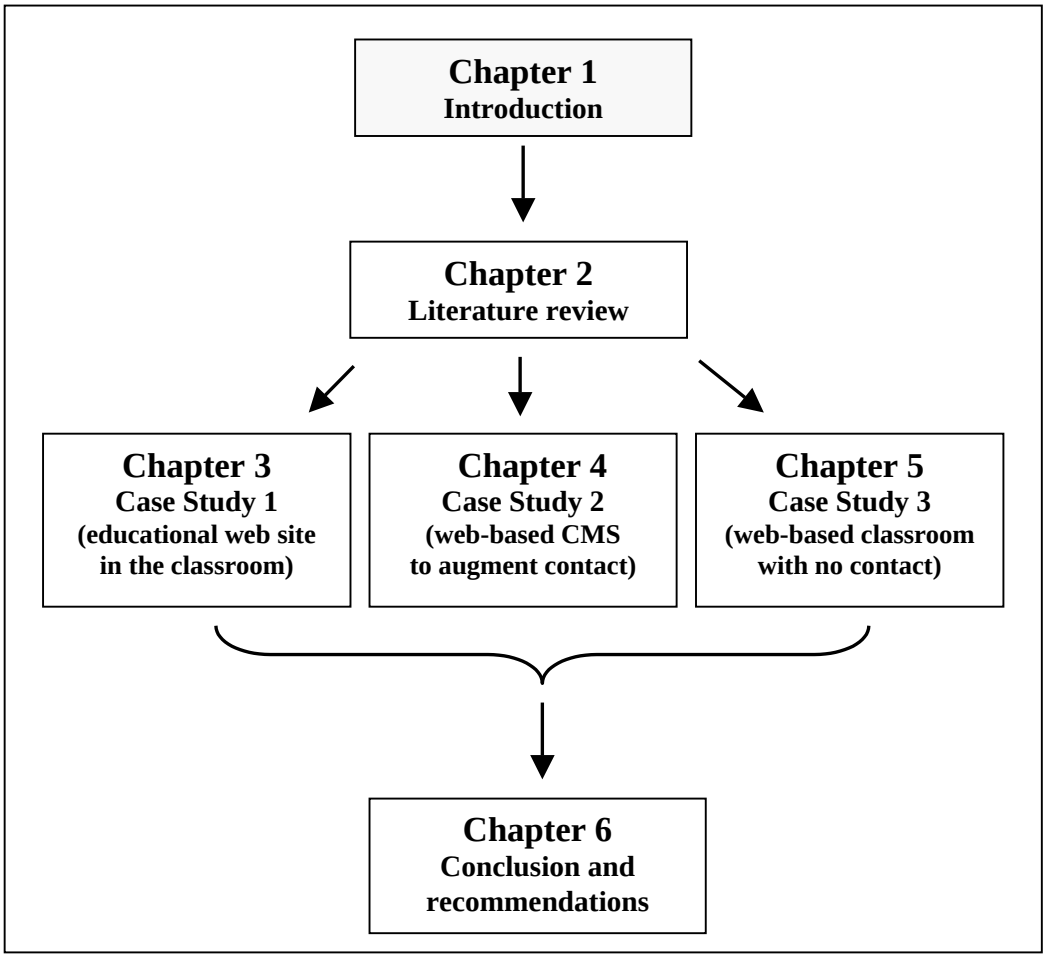
1.11 Outline of the dissertation

This dissertation is comprised of six chapters, of which an outline is given in Table 1.6. This is followed by a diagrammatic illustration of the outline of the dissertation, as depicted in Figure 1.2. This figure is shown at the beginning of each chapter, where the current chapter is blocked in blue, for the purpose of orientating the reader.

Table 1.6 Outline of dissertation

Chapter	Name of chapter	Description
Chapter 1	Introduction	The framework within which the problem is situated. It outlines the main points of the study and provides a general overview.
Chapter 2	Literature review	A review of relevant literature on aspects related to web-based technologies. The characteristics of learners are presented, as well as the web-learning possibilities for learners of different age groups, and types of teaching.
Chapter 3	Case Study 1	Description and investigation of *Plane Math* – an educational web site used in the classroom.
Chapter 4	Case Study 2	Description and investigation of *WebCT* – a web-based CMS used to augment contact.
Chapter 5	Case Study 3	Description and investigation of *RBO* – a fully online course, presented via a web-based classroom.
Chapter 6	Conclusions and recommendations	Integration of the results of the three case studies, and conclusions and recommendations regarding the way forward.

Figure 1.2 Diagrammatic illustration of the outline of the dissertation



1.12 Summary

The dissertation reports on an investigation of three web-based technologies to investigate learners' responses to, and experience of, them. This chapter has provided a framework within which the problem is situated. Chapter 2 sets out to answer the research questions by undertaking a literature review, in order to contextualise the research.