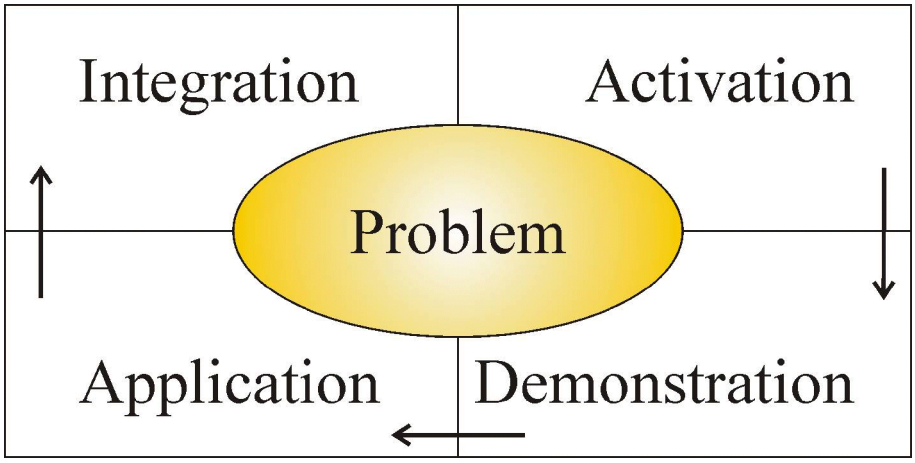
# Chapter 1 - Problem




**"Learning is facilitated when a learner is engaged in solving a real-world problem."**

(Merrill, 1997, p.5)

# Chapter 1 - Problem

## 1.1 Introduction

This essay reports on research conducted to determine the aspects to be considered when using Merrill's Model of Instructional Design. Merrill's Model was used to design and develop course work for senior students in the health sciences. The formative evaluation of the prototype was done by third-year dietetic students who had completed the paper-based course.

This research concluded with the formative evaluation of the prototype.

## 1.2 Background

### 1.2.1 Lifelong learning

Worldwide, political, social and economical structures are changing at an ever-increasing rate. These changes place an increasing strain on the educational systems that have to prepare learners for their roles in an ever-changing society. Companies need "employees who can take initiative, think critically, and solve problems" (Reigeluth, 1999, p. 18).

James Burke, a science journalist as quoted by James Gleick (1999. p. 81), comments,

> The rate of change will be so high that for humans to be qualified in a single discipline - defining what they are and what they do throughout their life - will be as outdated as quill and parchment. Knowledge will be changing too fast for that. We will need to re-skill ourselves constantly every decade just to keep a job.

In response to this strain, the focus of education and training is changing from educator-centred or teacher-centred to learner-centred. Learners are expected to pace their own learning and to become lifelong learners. Brophy defines lifelong learning as:

> a deliberate progression throughout the life of an individual, where initial acquisition of knowledge and skills is reviewed and upgraded continuously, to meet the challenges set by an ever-changing society.
>
> (Brophy et al. as quoted in Friedland, 2001, p. 49)

### 1.2.2 Lifelong learning in South Africa

Education and training in South Africa is also undergoing major changes. In 1981 the National Training Board (NTB) was established as the advisory board to the Minister of Labour to oversee the planned restructuring of education and training in the country. The National Qualification Framework (NQF) was established in 1995 and is currently setting

> a systemic framework for organising the education and training system around the notion of learning outcomes, from the end of compulsory schooling through to postdoctoral research in higher education and training, Additional priorities are systems and processes which support the tenets of democracy and outcomes-based education as an approach to education. (SAQA,. 2001, online)

Not only is the education system changing towards an outcomes-based approach, but from the White Paper on Education and Training (1995, online) it is clear that South Africa is also striving to educate towards lifelong learning. This is set out in the following paragraph,

> Successful modern economies and societies require the elimination of artificial hierarchies, in social organisation, in the organisation and management of work, and in the way in which learning is organised and certified. They require citizens with a strong foundation of general education, the desire and ability to continue to learn, to adapt to and develop new knowledge, skills and technologies, to move flexibly between occupations, to take responsibility for personal performance, to set and achieve high standards, and to work cooperatively. (SAQA, 2001, online)

### 1.2.3 Lifelong learning and e-learning

Educational institutions have to think of ways and means to accommodate the needs and demands of the lifelong learner. These learners need flexible learning environments and because of this educational institutions are investigating the advantages technology may offer. Friedland however warns of difficulties in the South African context,

> South Africa's e-readiness - the degree to which a country is ready or willing to integrate information and communication technologies (ICT) in its society or economy - is poor in comparison with the rest of the world, but rates high in comparison with other countries in Africa. (Friedland, 2001, p. 99-100)

The University of Pretoria is the largest residential university in South Africa and is committed to providing excellence in education. It is systematically establishing flexible learning environments to address the education needs of students who cannot be on campus. The Department of Telematic Learning and Education Innovation (TLEI) was established in 1997 to assist lecturers with "the innovative integration of contact tuition, paper-based distance education and electronic education" (TLEI. 2002, online). Its services include the instructional design and development for multimedia and web-based learning.

The TLEI supported this research project in a number of ways and is mentioned in the relevant sections of this report.

## 1.3 The Research Problem

### 1.3.1 The aim of the research

A multitude of instructional design models are being developed to assist the instructor in his changed role as facilitator, rather than being merely a source of knowledge. This study investigated the practical implications of using one of these models, Merrill's model of instructional design, for developing course work for senior students in the health sciences.

The Anthropometry course for third year dietetics students uses resources that are regularly updated by large pharmaceutical companies and also by institutions like the World Health Organisation (WHO). This made the course particularly suitable for presentation aided by electronic media. Merrill's approach of putting a real-life problem into the centre of the

instructional episode is particularly suited to the problem-based learning approach followed in the Faculty of Health Sciences and it was decided to use his model rather than another one.

### 1.3.2 The objectives of the research

The specific objectives of this study have been to:

- design and develop a multimedia tutorial for senior students in the health sciences using Merrill's Model of Instructional Design
- formatively evaluate the prototype program
- assess changes to improve the program
- reflect on the relation between Merrill's four phases, **Activation**, **Demonstration**, **Application** and **Integration**.

### 1.3.3 Scope of the project

The first three steps of the Analysis, Design, Development, Implementation and Evaluation (ADDIE) design process model were used for the project. The project concluded with the formative evaluation, which is part of the Development phase, of the multimedia program.

## 1.4 The Research Questions

### 1.4.1 Research questions

Research questions were formulated as follows:

- What is the role of a real-life **Problem** in a digital learning environment?
- What is the importance of **Activation** of relevant experience or existing knowledge?
- How successful can **Demonstration** be in a digital learning environment?
- How significant is the **Application** of the new knowledge under guidance in a digital learning environment?
- Is effective **Integration** of new knowledge possible in a digital environment?

### 1.4.2 Previous research

To place this essay in the context of other research done in South Africa, a search on related topics was done on the Nexus database, a database of all theses and dissertations, which is maintained by the National Research Foundation (NRF). Related research topics are listed in the table below.

| Author | Title | Year | Degree |
|---|---|---|---|
| Dlomo, L.C. | *Simulation - its Reliability as an Evaluation Tool for Clinical Proficiency among the Diploma Student Nurses at Ngwelezane College of Nursing* | unknown | MCur |
| Dolo, R.J. | *The Implementation of Computer Assisted Learning in the Teaching of Chemical Change* | 2000 | MSc |
| Fresen, J.W. | *Random Variables: a CAI Tutorial in Statistics for Distance Education* | 1997 | MA |
| Jacob, S. | *The Use of Interactive Computer Simulations to engender Conceptual Changes about Wave Motion* | 2001 | MEd |
| Jooste, J.P. | *Design Issues for the Support of Multimedia Educational Software on a LAN* | 1996 | MSc |
| Kemp, R. | *Die Verwantskap tussen Visualisering in Chemie en Multimedia-Onderrig* | 2000 | MSc |
| Schoeman S. | *Instructional Design for Distance Music Education* | 1999 | DMus |
| Steenekamp, J.H. | *Towards Guidelines for Tertiary Distance Education Courseware Design: a Textlinguistic Perspective* | 1999 | MA |
| Strehler, Anne | *Care of the Ventilated Patient: a CAI Program for Nursing Students* | 1994 | MEd |
| van Biljon, J.A. | *An Intelligent Computer-aided Education System Aimed at the Teaching and Learning of Mathematics according to the Problem-based Learning Approach* | 1998 | MSc |

Table 1.1 - Related research projects

From the topics listed in the table it is clear that this research project is relevant, but unique since none or the above research projects was concerned with a specific design model. Although Strehler's Computer-assisted Instruction program (CAI program) was also developed for students in the health sciences, it was aimed at nurses, whereas the CAI program in this study was developed for dietetics students.

## 1.5 Research Methodology

### 1.5.1 Type of research

The study continues with a literature survey on the relationship between learning theory, curriculum theory, instructional design theory and the instructional design process. Merrill's Model of Instructional Design is a particular focus.

The main part of the study is concerned with the practical implications of using Merrill's Model of Instructional Design and the formative evaluation of a multimedia instructional program designed on this model.

Reeves (2000) identifies six different goals for Instructional Technology Research: Theoretical, Empirical, Interpretivist, Postmodern, Development and Action Goals. This research falls into the Development Research category. Van den Akker (1999) identifies a significant characteristic of development research as focusing on "complex, innovative tasks for which only very few validated principles are available to structure and support design and development activities" (Reeves, 2002, p.7).

The study has a predominantly qualitative character since the findings are based on observations, a structured questionnaire, open questions and a group discussion.

### 1.5.2 Research schedule and responsibilities

| | Activity | Date | Team member |
|---|---|---|---|
| 1 | Proposal to TLO | Sept 2000 | Nordhoff, Wenhold |
| 2 | Literature review | February 2001 - October 2001 | Nordhoff |
| 3 | Course content outline | February 2001 - June 2001 | Wenhold |
| 4 | Design and develop prototype tutorial | July 2001 - October 2001 | Wolmarans et al. |
| 5 | Formative evaluation | 29 October 2001 | Nordhoff, Wenhold and Wolmarans |
| 6 | Writing research essay | November 2001 - April 2002 | Nordhoff |
| 7 | Final research essay | April 2002 | Nordhoff |

Table 1.2 - Research schedule and responsibilities

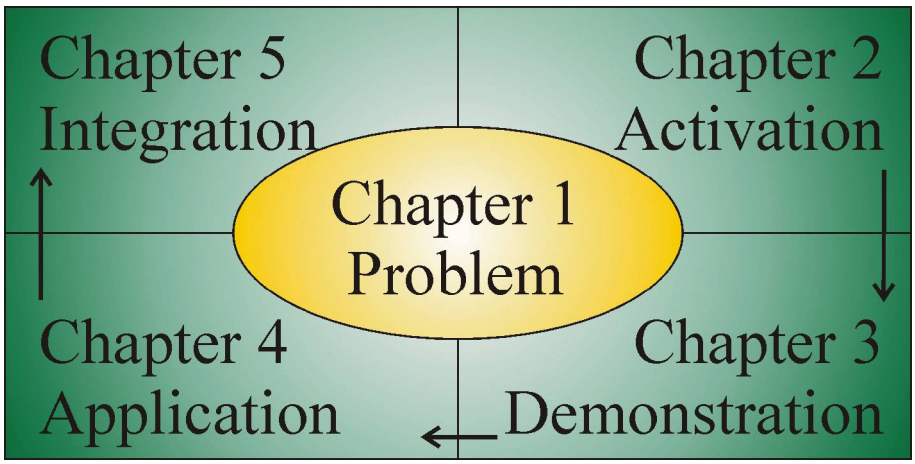
## 1.6 Limitations of the Study

The multimedia Anthropometry tutorial was developed for third-year dietetics students at the University of Pretoria, a very homogeneous group. The group members are all female, between 20 and 30 years old, mostly Afrikaans-speaking and fairly computer literate. The prototype was only tested by representatives of this group.

Although the multimedia program has the potential to become a valuable training resource for a range of health workers, testing of its suitability for other groups of health workers was not part of this study. The suitability of Merrill's Model for developing courseware in other educational fields was not investigated.

## 1.7 Overview of the Research Essay

This research essay consists of five chapters. The five elements in Merrill's Model of Instructional Design are the titles of the chapters.




| | | |
|---|---|---|
| Chapter 1 | **Problem** | The introductory chapter provides the background to the research problem. |
| Chapter 2 | **Activation** | This chapter reviews the literature of learning theory, curriculum theory, instructional design theory and the instructional design process, and looks at the relation between these theories. Particular attention is given to Merrill's Model of Instructional Design. |
| Chapter 3 | **Demonstration** | This chapter describes the process of developing a computer-based Anthropometry tutorial for senior dietetics students. |
| Chapter 4 | **Application** | This chapter discussed the formative evaluation of the tutorial program. |
| Chapter 5 | **Integration** | The final chapter draws conclusions and makes recommendations for further research. |

Table 1.3 - Overview of research essay