Chapter 3 - Demonstration
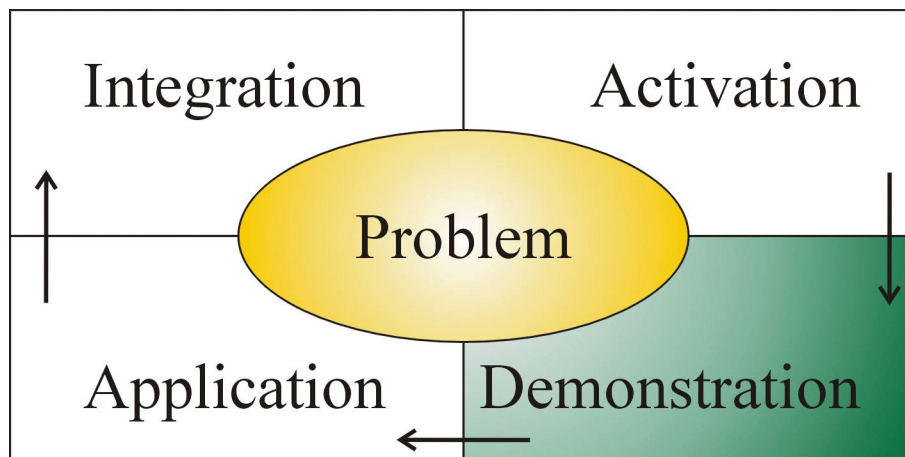

"Learning is facilitated when the learner is shown rather than told."

(Merrill, 2001, p. 6)

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Chapter 3

Chapter 3 – Demonstration

3.1 Introduction

This chapter provides an overview of the design process of the multimedia program for Nutritional Assessment. A summary of the different phases in Merrill's Model (Chapter 2, 2.5.1) is given as well as an analysis of the activities in the first three stages (Analysis, Design and Development) of the ADDIE model for this particular multimedia program. As this research project ended with the formative evaluation of the program, the implementation and summative evaluation are not part of this research document.

3.2 Background Information

Dietetics students enrolled at the University of Pretoria do a compulsory four-module course on Nutritional Assessment in their third year of undergraduate study. The modules, Nutritional Assessment 311 (NTA 311), Nutritional Assessment 312 (NTA 312), Nutritional Assessment 321(NTA 321) and Nutritional Assessment 322 (NTA 322) are currently presented in the traditional manner with three lectures and one two-hour practical session per week.

The Faculty of Health Sciences uses a problem-based learning (PBL) approach. Dietetics students enrolled for the Nutritional Assessment modules typically get a case study from which they have to extract the necessary information to make a nutritional diagnosis. For this diagnosis, they have to consult a variety of resources and reference manuals, e.g. Weight for Height tables, Body Mass Index tables, Nomograms. Some of this reference material is updated regularly by large pharmaceutical companies and also by institutions like the World Health Organisation (WHO). Globalisation and the increasing access to the Internet makes it worthwhile for these institutions to place the resources on the Internet rather than distribute them in printed form.

Ms. Friede Wenhold, the lecturer of the Nutritional Assessment modules, approached the researcher to discuss the possibility of producing a multimedia tutorial on CD for the Nutritional Assessment modules to assist the students. It was decided to develop a multimedia program for only one module, Anthropometry, and to test it first before adding the other three modules, Biochemistry, Clinical Assessment and Dietary Assessment.

To ensure the future of the program, the project was registered with Telematic Learning and Education Innovation (TLEI) at the University of Pretoria. The application (Appendix A) for funding was accepted and a team put together for the development of the program.

Merrill's Model of Instructional Design (Merrill, 2001, p.2) was used for the design and development of the multimedia tutorial on Anthropometry. Third-year dietetic students participated in the formative evaluation of the prototype.

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3.3 The Team

Alessi and Trollip encourage a team-oriented approach towards designing instructional courseware. "In our experience, and that of other designers, courseware is always better when several people collaborate." (Alessi & Trollip, 1991, p.245)

This approach is also followed at Telematic Learning and Education Innovation (TLEI) at the University of Pretoria.

For this project the team consisted of the following people:

• Ms Anne Strehler, project leader at TLEI at the University of Pretoria.

• Ms Friede Wenhold, subject matter expert and lecturer in the Department Human Nutrition in the Faculty of Health Sciences.

• Ms Henriëtte Wolmarans, designer at Telematic Learning and Education Innovation at the University of Pretoria.

• Ms Helga Nordhoff, educational researcher and MEd(CIE) student.

• Graphic artists, photographers and models.

• All third-year dietetic students for the formative evaluation.

• Dr Hermi Boraine, statistician from the Department of Statistics at the University of Pretoria.

3.4 The Design Process

The ADDIE model was used for the design process of this program.

At Telematic Learning and Education Innovation the five steps of the ADDIE model are subdivided into 17 steps:

1.	**Analysis**	Exploratory Phase	1.
		Broad Needs Analysis	2.
		Show	3.
		Target and Content Analysis	4.
		Project Proposal	5.
		Service Level Agreement	6.
		Training	7.
		In-depth Analysis	8.
2.	**Design**	Prototype	9.
		Demo of Prototype	10.
		Design	11.
3.	**Develop**	Development	12.
4.	**Evaluate, Implement** and **Evaluate**	Formative Evaluation	13.
		Summative Evaluation	14.
5.		Implementation	15.
		Student Feedback	16.
		Review & Maintenance	17.

Table 3.1 - The ADDIE model as used by TLEI

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3.4.1 Analysis

Target population

Traditionally dietitians in South Africa are female; there are only a few male dietitians. From a survey done of 211 dietitians by Friede Wenhold (1993, p. 94-95) for her Master's degree in Dietetics, the following facts have been documented:

Gender	99% female
Age	41% under 30 47% between 31 - 44 12% older than 45 years
Highest Qualification	50% 3-year or 4-year degree + diploma 36 % 4-year degree + diploma or honours 12% M or PhD/DSc
Experience	33% had less than 4 years experience 33% had 5 - 9 years experience 21% had 10 - 14 years experience 13% had more than 14 years experience
Period since last qualification	33% less than 4 years 28% between 5 - 9 years 20% between 10 - 14 years 19% more than 14 years

Table 3.2 - Dietitians in South Africa

This situation has not changed at the University of Pretoria. Dietetics students are still only female, mostly Afrikaans-speaking and fall into the age group, 18 - 22 years.

It was decided to use the whole class of third-year dietetics students for the formative evaluation of the program. Twenty-five female students were enrolled for the Nutritional Assessment course in 2001. Most of them were Afrikaans-speaking and it was assumed that they are computer literate since a computer literacy course has to be completed by all students who enrol at the University of Pretoria. Most South African universities currently have compulsory computer literacy courses for all their students. It is therefore acceptable to expect students to be fairly computer literate.

It was planned that by the time the program would be ready for this evaluation, the students would have completed the traditional paper and lecture-based course in dietetics and therefore should have become familiar with the content of the course work. This would enable them to provide feedback on navigational and aesthetic elements of the program, as well as on the content, the possible value of the program for the course, and its use and implementation in the following year for the modules they had just completed.

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3.4.2   Design

After a workshop titled 'Does your Instruction rate 5 Stars?' presented by David Merrill, at the University of Pretoria in February 2001, the researcher and design team decided to use Merrill's Model for the development of the Anthropometry tutorial. 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.

Merrill clearly states that his model is not appropriate for courseware consisting of reference material, isolated facts or psychomotor skills, nor for receptive or exploratory courseware. As an evaluation method, Merrill awards one Star to an instructional program for each 'yes' to the following five questions:

1. Is there a Problem to solve?
2. Is there Activation of existing knowledge?
3. Is there Demonstration?
4. Is there Application?
5. Is there Integration of the new knowledge?

He does not award Stars to tell-and-ask instruction.

For effective and efficient instruction, Merrill distinguishes between the following teaching parts (Merrill, 2001, Workshop notes, p.13):

Tell	Show	Ask	Do
part name & part description	entity portrayal & part portrayal	part name & part description	point to portrayal

Table 3.3 - Tell, Show, Ask and Do

The Tell and Show activities are instructor activities and fall into the Activation and Demonstration phases of the instructional event. The Ask and Do activities are learner activities and fall into the Application and Integration phases. The table provides an overview of the activities associated with Tell, Show, Ask and Do.

Instructor / Lecturer activity		Student activity	
Tell	Tell is associated with the naming of parts, a description process or a technique.	Ask	Ask the student to name a part or to describe a process.
Show	Show is the portrayal of an entity or the demonstration of a skill or technique. The 'show' should help the student to identify the different steps in a technique.	Do	Do provides an opportunity for the student to practise the newly acquired skills. The educator should be available to assist the student during this phase, but should gradually withdraw the support until the student is able to perform required activities/tasks without assistance.

Table 3.4 - Lecturer and student activities

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a. **The Nutritional Assessment course**

The Nutritional Assessment course as taught in the division Human Nutrition at the University of Pretoria is divided into four sections: Anthropometry, Biochemistry, Clinical and Dietary Assessment. An overview of the course is given in the figure below.
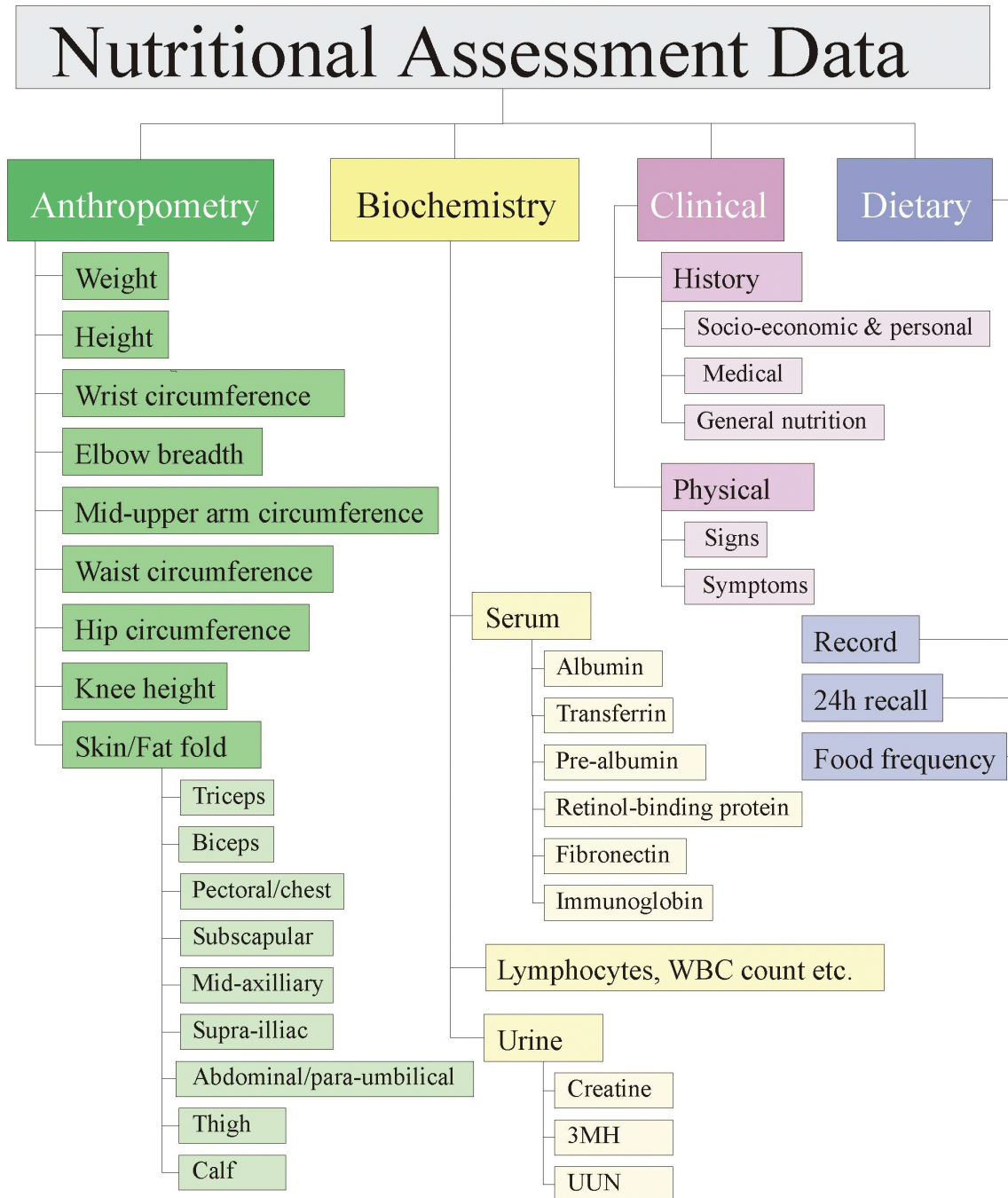

Figure 3.1 - Overview of the Nutritional Assessment course

Ms Friede Wenhold organised the content of the Anthropometry course in a table under the headings: Tell, Show, Ask, and Do (Appendix B).

An example, the section of the table for *Anthropometry -> Whole Body -> Infants and Children -> Waterlow classification*, is shown in the table below:

Tell	Show	Ask	Do
Wasting Weight for height Indices and indicators * Percentiles * % of median * Z-score Cut-offs	Refer back to weight and height Difference between wasting and stunting: (Photo: McLaren p11); Drawing: Waterlow p189 (fig 13.1) Nabarro wall chart = "Thinness chart" (Jeliffe & Jeliffe p19; King & Burgess p188)	Guided calculations Guided interpretation of limited given data	Paper case study: On own
Stunting Height for age Indices and indicators * Percentiles * % of median * Z-score Cut-offs	CDC growth charts (www.cdc.gov/growthcharts) Demonstrate: How to plot on growth charts How to interpret data Wellcome Trust CD	Guided calculations Guided interpretation of limited given data	Paper case study: On own

Table 3.5 - Tell, Show, Ask and Do for the Anthropometry course

Ms Henriëtte Wolmarans used the table as a guide during the design process of the program. She knew that topics listed under Tell had to become part of the reference section. Topics listed under Show were part of the Demonstration phase and should be integrated in the tutorials. Topics under Ask and Do are student activities and had to be placed into the guided problem-solving section or the case study section.

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b. Merrill's four phases and the Problem

The four phases of an instructional event according to Merrill are shown in figure 3.2. It is clear that the **Problem** is in the centre of events. Merrill usually starts with **Activation**, then goes to **Demonstration**, **Application** and **Integration**.
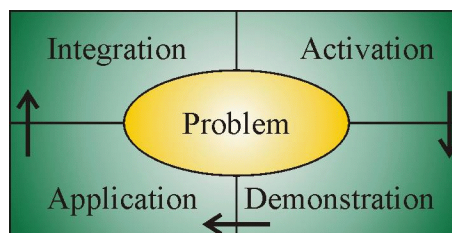

Figure 3.2 - The four phases of instruction

Table 3.6 provides a graphic summary of what happens in the Anthropometry course in each of Merrill's four phases.

Integration	Activation
Integration of the new knowledge with the existing knowledge is achieved if the student gets the opportunity and time to practise and apply the newly developed skills. Dietetics students get the opportunity to practise the anthropometric measurement techniques on each other during the practical sessions in the 'skills laboratory' before they are allowed to use their skills in a clinical situation. A computer program is not suitable to test the integration of a physical skill.	The first phase of the instructional event is the activation of existing knowledge. This is to enable the learner to activate appropriate, existing mental models onto which the new knowledge can be built. According to the lecturer, the content of the anthropometry course is so new and different that there is no previous knowledge that could be activated by a pretest.

The Problem

The case studies given to the students once they have completed the theoretical part of the paper-based course are suitable problems for this tutorial program. These case studies typically describe a patient and relevant nutritional problems, as well as circumstances and any lifestyle problems. The student is also provided with some data (measurements, etc.) and clinical information about the patient. She then has to make a nutritional assessment of the patient.

Application	Demonstration
Once the dietetic student knows how to take anthropometric measurements, she has to practise interpreting the results of these measurements. This requires higher-order thinking skills and part of the challenge of the Nutritional Assessment course is the development of these higher-order thinking skills. The student is supposed to read through a given case study, then use the information to make calculations and write a short summary of the nutritional assessment of the patient mentioned in the case.	In the Anthropometry course the students have to learn a large number of physical skills in taking anthropometric measurements using special equipment. Demonstration in this case is of great value, because the instructor can show the correct method and focus the attention of the student on important information. Many photos and a few videos were used in the program to demonstrate the different techniques the students have to acquire.

Table 3.6 - Merrill's instructional phases for the Anthropometry course

3.4.3   Development of the program

The development of the program was done by Ms Henriëtte Wolmarans, an instructional designer at Telematic Learning and Education Innovation. She was assisted by graphic designer Marcel Hoffmann.

a.   Colour scheme

The colour scheme of the tutorial is very feminine; different shades of green are used throughout the tutorial. Occasionally a light brown is used for contrast. The first screen of the prototype is shown in the figure below.
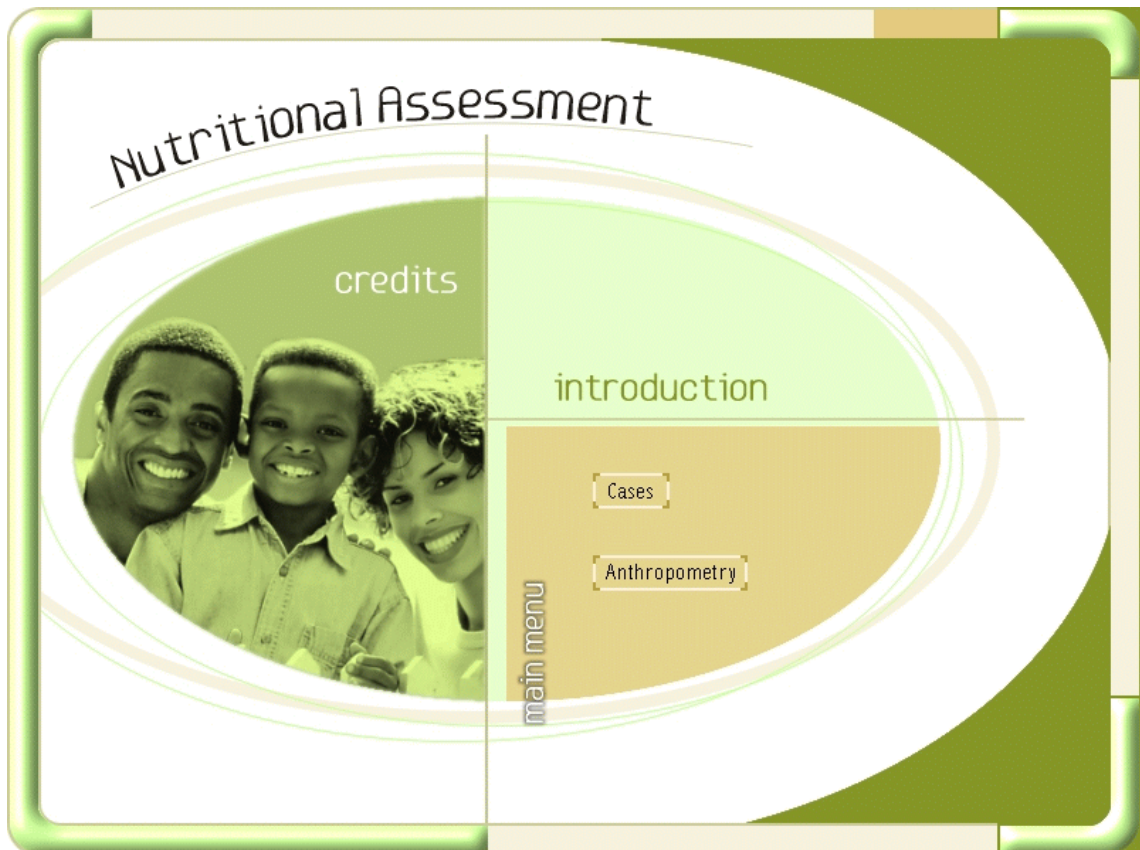
Figure 3.3 - The first screen of the Anthropometry tutorial

b.   Structure

The program consists of four main sections: case-studies, an Anthropometry tutorial, a measuring tutorial and a resource collection consisting of tables and graphs which are needed by dietitians to interpret the anthropometric measurements. Links are provided to the MS-WINDOWS programs, NotePad and Calculator.

c.   Case studies

The prototype had two case studies (a child and an adult) for which the students could make a nutritional assessment.

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d.   Tutorial

The Anthropometry tutorial is a basic, text-based tutorial, adopted from an online tutorial designed by Bill Bender and Sandy Remancus (Bender et.al. 2001, online). It follows the classical structure of a tutorial.

e.   Measuring Tutorial

The measuring tutorial uses photographs and a few videos to show measuring equipment and to demonstrate measuring techniques. (Figure 3.4)

Figure 3.4 - Photo showing how to measure abdominal skinfold thickness

f.   Resource collection

An extensive resource collection consisting of numerous tables as well as formulae is part of the program.

g.   Sound

No sound was used in the program. Sound was not seen as an important element of the program in the early stages of development since it is easy to add later and the designers were under severe time pressure to get a prototype ready for the set date of the evaluation by the students.

Sound has certain disadvantages, as pointed out by Fleming and Levie, "Print and pictures are more durable than speech, they are available for processing longer." (Fleming & Levie, 1978, as quoted in Gagné, 1987, p. 241.) Sound also requires additional hardware and can be very distracting, particularly if the program is to be used in a computer laboratory situation. It can, of course, be turned off or muted but then any benefit of narrated explanations is lost.

3.5 Conclusion

The lecturer, Ms Friede Wenhold, successfully organised the content of the Anthropometry course into the categories Tell, Show, Ask and Do. This enabled the design team at Telematic Learning and Education Innovation to develop a multimedia program according to Merrill's Model.

The prototype was completed in time for the planned formative evaluation. Third-year dietetic students were observed by their lecturer, the designer and the researcher while they were using the program. They then completed a questionnaire and were given an opportunity to express their views in an open discussion. The next chapter discusses the findings of that evaluation.

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