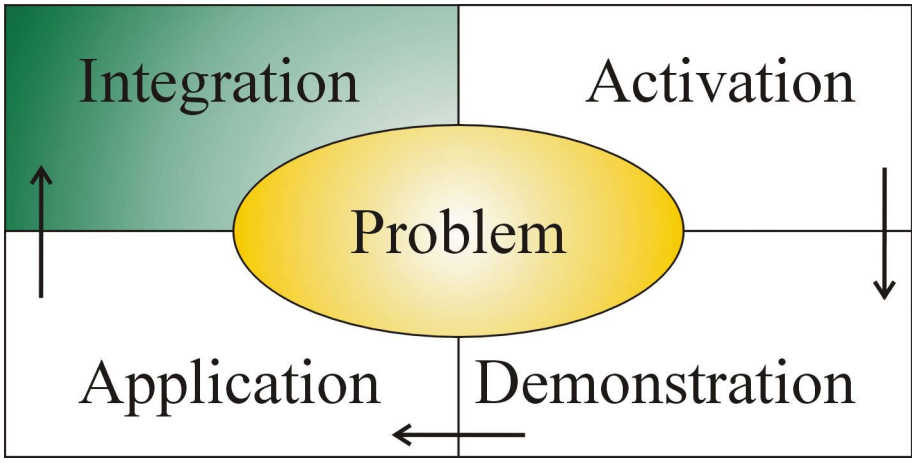
Chapter 5 - Integration



"Learning is facilitated when the learner can reflect on, discuss, and defend his or her new knowledge."

(Merrill, 2001, p. 7)

Chapter 5 – Integration

5.1 Introduction

This chapter synthesises the findings from the data collected during the formative evaluation of the program and focuses on answers to the research questions:

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

The chapter considers the integration of the five elements of Merrill's Model and how they influence each other.

The limitations of the study are discussed briefly. Recommendations for the use of the program in the curriculum and for additional development of the program are made, as well as recommendations for further research.

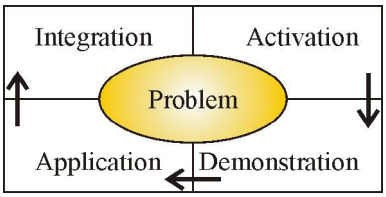
5.2 Discussion of the Conclusions

The addition of this multimedia tutorial to the Nutritional Assessment course is an attempt to provide a more flexible learning environment based on a sound instructional strategy, for the students. As noted by Merrill,

> An appropriate instructional strategy incorporates all of the necessary conditions for presenting the knowledge or demonstrating the skill, providing practice with feedback, and providing learner guidance for a given type of outcome. Information that does not include presentation, practice, and learner guidance is information but not instruction. (Merrill in Reigeluth, 1999, p. 401)

The answers to the above research questions were concluded from the questionnaire, the observation of the students during the evaluation of the program and the group discussion after the evaluation. All observers were impressed by the commitment of the students and their willingness to assess the program critically and express their views.

5.2.1 What is the role of a real-life Problem in a digital learning environment?



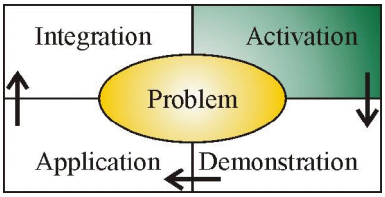
The role of a real-life problem in a digital environment is the same as its role in a normal classroom situation. As explained by Davis and Harden,

> It is explicitly used to get students themselves to identify and search for, the knowledge that they need to obtain in order to approach the problem. (Davis and Harden, 1999. p.4)

The students perceived the case studies in the multimedia program as relevant, real-life problems and requested more case studies in the program. The fact that only a few attempted to solve one of the two case studies given can be explained by the lack of direction at the beginning of the tutorial. The students then continued searching for information to fill the gaps in their own knowledge about measuring techniques.

Presenting a real-life problem in a digital environment is insufficient. Students have to be guided to the problem.

5.2.2 What is the importance of Activation of relevant experience or existing knowledge?

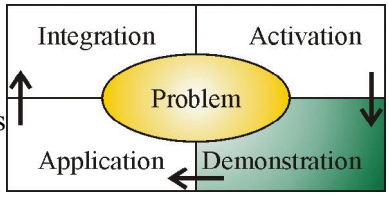


The students were generally very satisfied with the look and feel of the program as well as with the quality of the photos and videos. There was, however, a serious problem with the navigation and this prevented the activation of **relevant** pre-knowledge. Knowledge is considered to be inert and the failure to activate prior knowledge in a problem solving environment obstructs the learning process.

In a digital environment, students are often left to their own devices. If relevant pre-knowledge is not activated, the students will replace the instructional problem with their own learning problems. During the demonstration phase they will look for new knowledge to solve their own problems and during the application phase they will apply the new knowledge to solve their own problems, rather than the problem chosen by the instructor.

Students will only integrate existing knowledge with new knowledge that fits onto the foundation of knowledge called upon during the activation phase.

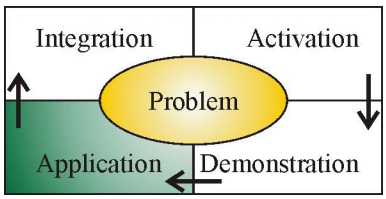
5.2.3 How successful can Demonstration be in a digital learning environment?



The photos and videos used during the demonstration phase were extremely successful to demonstrate Anthropometry measuring techniques, even to students who were supposed to know them well. The students commented that some techniques were explained better with a photo than through a real-life demonstration. The lecturer also realised that in some cases the students understood the correct technique better if the incorrect technique is illustrated as well. The erroneous technique should, however, be pointed out to the student.

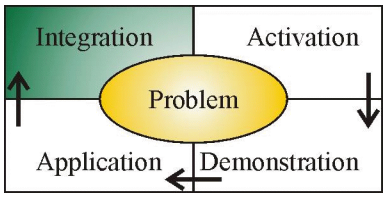
5.2.4 How significant is the Application of the new knowledge under guidance in a digital environment?

Students need to be shown how to apply the new knowledge to solve the problem. The problem-solving examples were not included in the prototype, which was one of the main complaints from the students about the program. They specifically requested examples of how to solve a case study.



5.2.5 Is effective Integration of new knowledge possible in a digital environment?

The digital environment is not the right place to practise physical skills. The final integration of new anthropometric skills should take place in the skills lab. The digital environment is, however, well suited for the writing of reports, doing calculations, tabulating data and the presentation of results from data, i.e. graphs. The students just needed more guidance in the form of examples to be able to solve a case study on the computer.



Nearly all the students saw the multimedia program as a valuable addition to lectures and practicals but not as a replacement of either.

These conclusion are summarised in tables 5.1.

	Activation	Demonstration	Application	Integration
Problem	Only relevant pre-knowledge prepares the student for the instructional problem.	Students will look for that in the new knowledge, which will solve their problem.	Students will attempt to solve their problem under guidance of lecturer.	Students will solve own problem using new skills.
Activation		The activated knowledge is foundation for new knowledge.	Combine pre-know-ledge with new knowledge to solve current problem.	Integrate new knowledge with activated knowledge.
Demonstration			Apply knowledge from demonstration to solve own problem.	Integrate know-ledge from demo with activated knowledge.
Application				Supported appli-cation is the first step towards integration.

Table 5.1 - Conclusions to research questions

5.2.6 The student's own problem

It was found that students replace the instructional problem with their own problems if the relevant pre-knowledge for the instructional event is not activated. This then has a snowball effect.

If the students' own problems have replaced the instructional problem, the students will look for solutions and applications to their problems during the demonstration phase.

In the application phase, students will again attempt to solve their own problems, rather than the instructional problem.

	Activation	Demonstration	Application	Integration
Student Problem	Wrong activation - student problem replaces the instructional problem.	Students look for solutions to own problem.	Apply new skills to own problem.	Solve own problem.

Table 5.2 - Conclusions regarding student's problem

5.3 Limitations of the Study

In the project application to Telematic Learning and Education Innovation the possibility of using the program as part of the Continuing Professional Development (CPD) program for practising dieticians and other health workers, was mentioned. The demographic profile of health workers in South Africa is totally different from the fairly homogeneous group of dietetics students. The program was not tested by members of the larger health workers group. Before it can be used as part of any Continuing Professional Development programme for health workers, it should be evaluated by a representative group.

5.4 Recommendations

5.4.1 Recommendations regarding the program

The designer received the following recommendations:

- A menu giving a good overview of the program, a clickable index, structured text using more conventional bullets and indentations, and improved navigation will make the program more user-friendly.
- If the login screen is moved to the start of the application phase (the point at which the student attempts to solve the case studies), the value of the program as a resource and reference tool may increase.
- Some activation of existing knowledge should take place. According to the lecturer there is very little knowledge that can be activated in a first-time user, but in that case, the first screen or screens should set the scene or at least gain the attention of the learner. This should help to activate relevant pre-knowledge and prevent the learners from substituting the instructional problem with their own problems.
- The planned examples of how to solve the case studies should be included to provide an opportunity for the students to practise.
- The possibility of presenting the course as an HTML-course (with CD support) should be investigated, since many resources are available and are regularly updated on the Internet.

5.4.2 Recommendations regarding the implementation of the program

Although the students were fairly computer literate, not one of them was familiar with the 'Alt-Tab' command to switch to a hidden screen. From the questionnaire it is also clear that only a few of them are familiar with spreadsheets. It is advisable to have an introductory session with the students to ensure that they have the necessary computer and Internet skills to get the optimal benefit from this program.

The program was not planned as a substitute for lectures or practicals and most students stated that they would like to use the program as an additional resource, and not as a replacement of contact time with the lecturer.

5.5. Recommendations for Further Research

The following areas offer opportunities to pursue findings from this study:

- Is there a general tendency amongst students to solve their own problems rather than the instructional problem?
- What influences the tendency amongst students to solve their own problems rather than the instructional problem?
- How does Merrill's Model work for other instructional events in the health sciences with different target populations?
- What is the value to the student of comparing correct and incorrect techniques in a digital learning environment?

5.6 Conclusion

This study investigated the implications of using Merrill's Model of Instructional Design for developing course work for senior students in the health sciences.

The formative evaluation of the prototype made it clear that the activation of relevant pre-knowledge is of utmost importance to all four instructional phases in Merrill's Model: **Activation**, **Demonstration**, **Application** and **Integration**. If the relevant pre-knowledge is not activated, the instructional problem will be replaced by the student's own problem.

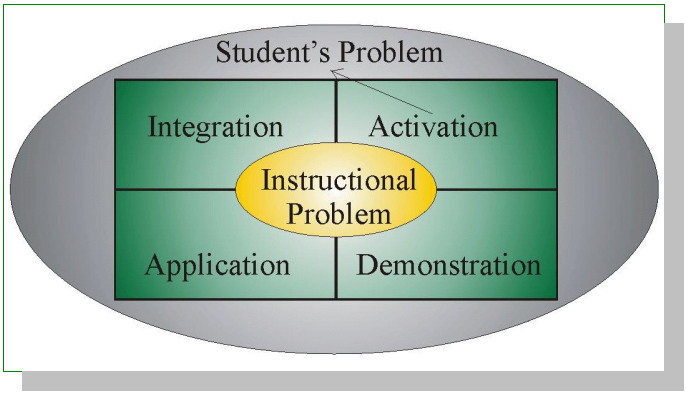


Figure 5.1 - Merrill's Model and the student's problem

It was clear from the positive responses of the students and the lecturer that the program will be a valuable addition to lectures, practicals, the textbook and other resources used in the Nutritional Assessment course. Future dietetic students as well as health workers should benefit from it, particularly if the other three sections, Biochemistry, Clinical Assessment and Dietary Assessment, are added.

This program has the potential to become a valuable, constant reference source for the practising dietician and a tool to assist other health workers in acquiring a basic understanding of Nutritional Assessment.