CHAPTER 6
SUMMARY AND RECOMMENDATIONS

Introduction

One of the concerns in nursing education is the need to teach science concepts effectively. Science is a major component of nursing curricula, but nursing students often struggle with science concepts. Can instruction in computer-assisted self-regulated learning techniques be used to improve student outcomes in a science course?

This study used the self-regulated learning technique of forethought in a survey of nursing graduate students to determine what importance they place on science concepts taught in a biology course. The study also used self-regulated learning processes of performance and reflection to clarify methods that can be used in effective science teaching. This chapter presents a summary of the study, conclusions reached, and recommendations for future research.

Summary

The purpose of this study was to determine if computer-assisted self-regulated learning strategies are effective tools to improve nursing student performance in science courses. This active learning process may lead to increased motivation and increased self-efficacy. The initial survey given during the forethought phase assessed: 1) student beliefs about the importance of course objectives and perceived relevance of content to their clinical nursing skills; 2) time constraints encountered by students; and 3) perceived self-efficacy in an advanced science course. The modeling/performance phase compared computer-assisted feedback to outcomes in a lecture/worksheet format. Feedback performance of elaborate explanations of answers was compared to simple verification feedback of correct/incorrect. In the final phase, self-reflection was used to determine potential effects that the feedback has on retention of concepts by
allowing students the opportunity to make adjustments in answers for both the computer tutorials and the non-computer worksheets. This study was designed to answer the following research questions.

1. What are the time budget demands on a graduate nursing student? Do time budget demands have an effect on exam grades in a science course?

2. What importance to practice do nursing graduate students place on science course objectives both knowledge level (undergraduate) and application level (graduate)?

3. How does providing computer-assisted tutorials change student performance on examinations as compared to pencil/paper worksheets?

4. Do elaborate feedback answers affect student performance on examinations as compared to verification (correct/incorrect) type feedback?

5. Do students retain concepts taught through use of computer tutorials differently than concepts taught using paper and pencil worksheets as measured through a comprehensive final examination?

Conclusions

In the forethought phase of this study, students were asked to respond to questions concerning their beliefs about biology concepts, provide background data, and provide insight into the time constraints they were facing during the course. Previous surveys on importance of biology concepts to nursing considered courses as a whole. The students considered biology as important to their practice, but indicated the courses were too in-depth for their needs (Clarke, 1995; Courtenay, 1991; Nicoll & Butler, 1996). The students in this course rated the course as important to their clinical practice by rating the overall course as 4.37 on a scale of 1 - 5. This study was unique in surveying students about specific content level objectives. Significant
amounts of the course content, as measured by content level objectives, were not found to be as important, as rated by the students.

The content of highest importance to the students were the holistic aspects of biology where the focus is on the function of the person, signs or symptoms of a disease, or on a particular organ system. The mean score for these objectives was 4.13. The content of low importance to the students were the cellular and molecular concepts. The mean score for these objectives was 2.49. The use of application level objectives such as those rated at the graduate level did not increase the student’s perception of the importance of these concepts to clinical practice. New discoveries in biology such as advances in genetics and immunology and their effect on healthcare increase the need to teach cellular and molecular concepts. Therefore, this study indicated that a method must be devised to improve awareness on precisely how these concepts are being used in clinical practice today.

The survey also focused students on their time budget constraints including the need to balance work, home and school demands. Analysis of exam scores in this study indicated no significant change in the computer exam scores as compared to paper and pencil exam scores for any of the time constraints from home, work and school. The high percent of students who were attending school while caring for children at home, balancing full-time work schedules, driving long distances to attend classes, and trying to find time to study for a difficult course indicates the need for additional study assessing the impact these have on learning.

As the study progressed, students were given opportunities to improve their performance through use of computer assisted feedback techniques. The students had significantly higher scores on the computer-assisted examinations than on the three paper and pencil examinations prior to that time. Although one computer examination was significantly higher than the others,
all of the examinations had mean scores above 84%. The fourth paper and pencil examination was given between the computer examinations. The mean score for this exam and the fifth examination were similar to the mean scores on the computer examinations. This supports the notion that self-regulation allowed the students to perform better not only on the portion of the course where this process was taught but also, improved performance in other aspects of the course.

Student improvement through feedback reflects the ability of students to ascertain how the instructor might ask a question and seemed to improve study efficiency. In addition, the feedback received from the instructor rather than from other students may have also contributed to the improvement in the student’s ability to discern how the instructor reasons through a question, thus influencing responses on all examinations. Also, students may have learned to use the concepts of cellular and molecular biology in the beginning of the course to improve efficiency and effectiveness at the end of the course.

The students received two basic types of feedback in this study, elaborate and simple. The examination scores did not reflect any significant differences with regard to feedback type. While many studies indicate immediate feedback is important, few studies have been completed to evaluate what content is needed in feedback given to students. Research into methods of improving scores through feedback can be undertaken. This would assist in understanding how students with various needs respond to the different types of feedback.

The retention phase of the course indicated a significant decline in final examination scores, with a mean score of 79.12. This decline was back to a level similar to scores on the first three course examinations. This decline may be a reflection of additional constraints on the students from meeting deadlines in other courses. It may also be attributed to the lack of active
learning processes for the final examination. Students were given numbers of questions to review. They were not actively seeking answers nor participating in tutorials. These types of activities might have improved recall of specific content and allowed students to determine which areas of content needed additional study.

**Recommendations**

This survey indicated that students found cellular and molecular biology concepts of low importance to the practice of nursing. It may be suggested that this content be diminished or eliminated. However, the opposite is more likely to be true. Modern medical practice is moving more significantly into the areas of genetics, neurobiology, and immunology. The need is greater for nursing students to have a solid grasp on these biological concepts. Therefore, effective instruction of nurses or other clinicians in the cellular and molecular aspects of biology courses is needed. This study indicated it is not enough to use application level objectives, but to find methods that integrate these concepts with clinical practice.

One method for improving the application of cellular and molecular concepts might be to have collaborative groups of nursing instructors, biology instructors and practicing nurses. Few nursing instructors major in biology and few biology instructors also major in nursing. The collaboration of these groups might help each group understand how these concepts may be more effectively applied to practice and not just application to a in-depth study of the human body.

Although no significant differences were found between the two variables of examination score averages, the time constraints for college students needs additional exploration. The students in this study seemed to have many demands on their time between work, home, and school demands. Their average for all examination scores may have been reduced without the ability to detect through techniques used in this study.
Use of self-regulated learning techniques demonstrated improved examination scores until the examination measuring retention. Students seemed enthusiastic about computer examinations and the course evaluations indicated that students would like more of these. The scores on the examinations indicated that feedback is critical in student performance in a class. Students need feedback to know what and how to study, especially in a content heavy course. For nursing graduate students, the type of feedback the student received did not appear to affect grade performance.

Additional work needs undertaken to determine how to use the computer-based environment in retention of concepts. The content evaluation obtained from the retention phase of this study indicated that some concepts had improved scores, while others had diminished scores. Additional research could be designed that would give students assistance in retention, an important phase for clinical application.

One method of improvement may be to design additional computer tutorials for practice during the retention phase. This practice might include scenarios relating the cellular and molecular aspects of the course to clinical applications. This may increase motivation and improve retention. In addition, a tutorial could specifically focus on review and retention. The more times the student can review, the more likely he or she will be to retain that content. The techniques used in this reinforcement might improve the student’s self-regulated techniques in studying difficult or content heavy courses throughout their college careers.