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Cognitive, Retention and Transfer of Learning Consequences of Computer Assisted Instruction and Videotape Instruction with Registered Nursing Students

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COGNITIVE, RETENTION AND TRANSFER OF LEARNING CONSEQUENCES OF COMPUTER ASSISTED INSTRUCTION AND VIDEOTAPE INSTRUCTION WITH REGISTERED NURSING STUDENTS

by

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ABSTRACT

Cognitive, Retention and Transfer of Learning Consequences of Computer Assisted Instruction and Videotape Instruction with Registered Nursing Students.

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The purpose of this study was to compare the effects of Computer Assisted Instruction (CAI) and Videotape instruction on cognitive, transfer and retention learning consequences of RN students pursuing a Bachelor of Science degree in nursing. The sample consisted of 18 registered nurses who were enrolled in a sophomore level physical assessment course. The research design was a pretest-postest experimental design. Mastery of Learning Theory and Transfer of Learning Theory provided the theoretical framework for this study. The Mann Whitney U Test, significant at $P<.05$, was performed to test for significant differences between the groups on the dependent variables. The major findings of this study were that there were no significant differences between the use of CAI and the use of Videotape Instruction on cognitive, transfer or retention of learning consequences. Demographic information was composed of female nurses under the age of 40, who work full time and have worked as an RN for greater than five years.

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Introduction

Challenged with teaching registered nurse (RN) students with diverse educational backgrounds and varied experiences, today's nurse educators are exploring alternative teaching strategies. RN students returning to pursue a baccalaureate degree in nursing differ from generic students on demographic variables such as age, number of semesters completed at a school, previous degrees obtained and marital status; in addition today's RN students have different motivators for enrolling, different personal issues, as well as different work and career issues (King, 1987). Computer Assisted Instruction (CAI) may be one method of accommodating students with such diverse backgrounds. CAI provides a stimulating individualized learning environment and permits students to study important concepts at their own pace.

Current trends in nursing education recognize that nurse educators should have not only advanced nursing knowledge and practical skills, but also knowledge and skills related to the nurse educator role (National League for Nursing, 1979). The ability to develop objectives, assess learner needs and evaluate student performance are frequently reviewed in the nursing

literature. However factors which affect the selection of learning strategies have received less attention (Ostmoe, 1984).

The use of CAI in baccalaureate nursing education has increased significantly over the past 20 years. A recent survey conducted by the National League of Nursing (NLN) assessed the level of CAI use in NLN accredited baccalaureate nursing programs in the United States. Of the 339 (76%) who responded, 164 (48%) indicated CAI use. Fifty-six (16%) respondents identified CAI use in courses prior to nursing courses, and 151 (44.5%) respondents indicated its use in nursing courses (Hebda, 1988). Despite the increase in the use of CAI in nursing education, its effectiveness as a teaching strategy has yet to be established.

Purpose

The purpose of this study was to compare the effects of CAI and Videotape Instruction on cognitive, transfer and retention learning consequences of RN students pursuing a Bachelor of Science degree in nursing.

Problem Statement

"Our ability to produce and build educational equipment has exceeded our ability to comprehend its

application" (Meadows, 1977, p. 14). Belfry and Winne (1988) completed a comprehensive review of the effectiveness of CAI in nursing education and concluded "further research is needed to determine whether CAI in nursing education is as effective as other methods for promoting retention of learning and application of knowledge to other situations" (p. 83). Nurse educators are challenged with determining whether CAI is worth the time, money and effort it would take to change from teaching strategies presently used. "With the massive amount of knowledge and skill required in the nursing profession, development of effective strategies for assisting the mastery of learning objectives is critical" (Day and Payne, 1987, p. 35).

Theoretical Framework

Mastery of Learning Theory and Transfer of Learning Theory provided the theoretical framework for this research study. Based on these two theories, the cognitive, transfer and retention consequences of CAI and Videotape Instruction were studied.

The theory of mastery learning has been widely accepted by educators for many years. It was developed by Benjamin Bloom of the University of Chicago (1968) and elaborated by James H. Block (1971). It is based

on a "model of school learning" developed by John B. Carroll (1963).

In Carroll's "model of school learning", time is considered a central variable. According to Carroll, students differ in the amount of time they need to learn a given set of learning objectives (1963). This model is supported by recent research which suggests that the bottom five percent of the students in a class will take five times as long as the top five percent of the students in a class to meet the desired learning objectives (Block, 1971).

The full Carroll model, "proposed that under typical school learning conditions, the time spent and the time needed were functions of certain characteristics of the individual and his instruction. The time spent was determined by the amount of time the student was willing to spend actively involved in the learning, (i.e) his perseverance and the total time he was allowed" (Block, 1971, p. 6). The learning time each student required was determined by the student's aptitude for the task, the quality of instruction, and ability to understand the instruction.

Within Carroll's model, Aptitude was defined as the amount of time necessary to meet the desired

learning objectives. Quality of instruction was defined as the degree to which the presentation, explanation and ordering of the learning tasks approached the optimum for each learner. Ability to understand instruction was defined as the ability of the learner to understand the nature of the task he was to learn and the procedures he was to follow in his learning (Carroll, 1963). The model proposed that the quality of the student's instruction and his ability to understand it interacted. For example, if both the quality of instruction and the ability to understand it were high, then little or no additional learning time would be required. However, if the quality of instruction and/or the ability to understand instructions was low, then additional time would be required. The full Carrol model is presented below:

$$\text{Degree of Learning} = F\left(\frac{\text{1. Time Allowed}}{\text{3. Aptitude}}\ \frac{\text{2. Perseverance}}{\text{4. Quality of Instruction}}\ \text{5. Ability to Understand Instruction}\right)$$

Benjamin Bloom (1968) operationalized the model outlined by Carrol. He reasoned that if aptitudes were predictive of learning time, not the level at which a student learned, it should have been possible to fix the degree of learning expected of students at some

mastery level and to systematically manipulate the relevant instructional variable in Carroll's model such that all or almost all students attained it.

If students are normally distributed with respect to aptitude for some subject and all students are given exactly the same instruction (in terms of amount and quality of instruction and learning time allowed), then achievement measured at the subject's completion will be normally distributed. Under such conditions the correlation between aptitude and achievement will be relatively high (r = + .70) or higher (figure 1). Conversely, if students are normally distributed with respect to aptitude, but the kind and quality of instruction and learning time allowed are made appropriate to the characteristics and needs of each learner, the majority of students will achieve subject mastery. The correlation between aptitude and achievement should approach zero (figure 2) (Bloom, 1968, p. 4).

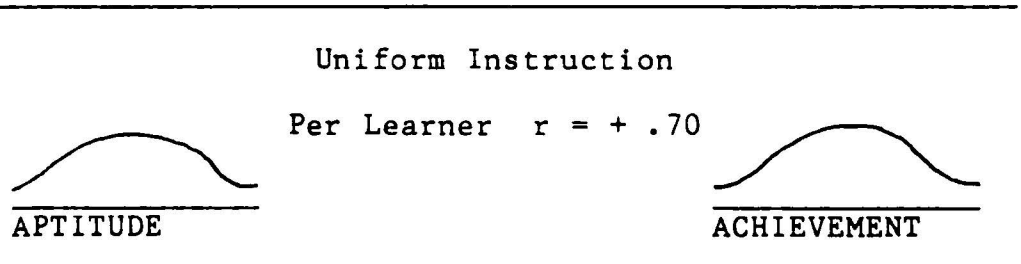


figure 1

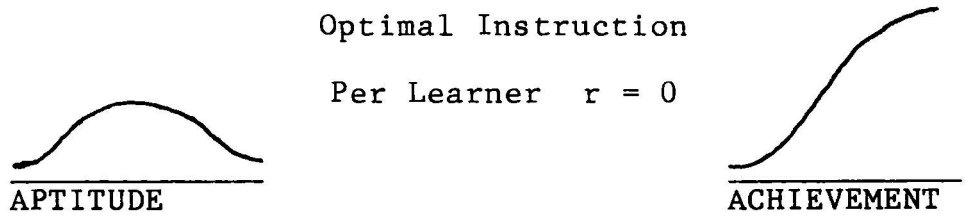


figure 2

One of the major contributions of Bloom was to develop a "mastery approach" which allowed students all the time they needed, motivated the students, and increased the likelihood that good instruction would be provided and understanding of instruction would take place. Tests were viewed as diagnostic and were administered to students when the students stated they had mastered the material. Feedback to the students was rapid. Students who did not demonstrate the level of mastery deemed appropriate received immediate help in correcting the situation. Bloom concluded that once students, even slow performers, realized that they could achieve the same level of proficiency as anyone else in class, even if it takes 50% longer, they were motivated by their successful experiences.

The tutorial pathway in CAI is an example of a mastery teaching strategy. It incorporates the principles of mastery learning as evident in the following features: (1) the student responds in an

active fashion to the material; (2) the student receives immediate feedback on the correctness of his response and has the opportunity to review the content he had missed; (3) the student proceeds at his own pace and is allowed as much time as he needs; and (4) the student studies a carefully designed program which contains clear instructions.

Videotape Instruction is an example of a nonmastery teaching strategy. The student's role in Videotape Instruction is a passive process. There is no direct student interaction, no feedback mechanism, and it is not self paced.

Transfer of Learning Theory provided the basis for phase two of this study. The phenomenon of transfer refers "to the influence of prior learning on performance in some new situation" (Ellis, 1965). The study of transfer involves the comparison of experimental and control group performance on some transfer task. If the experimental group performs superior to the control group, it is called positive transfer; if the reverse occurs, it is called negative transfer; if the two groups remain the same, there is zero transfer (Ellis, 1965).

Transfer of Learning Theory proposes that positive transfer occurs in situations in which prior learning

aids or facilitates subsequent performance. For example, if students are provided with an opportunity to practice in situations that are similar to actual situations, and they have mastered the material presented, they will be able to apply the theoretical or conceptual knowledge presented to similar situations.

Unlike the earlier studies done by Thorndike and Woodworth (1901) which focused only on whether or not transfer occurred, recent research in transfer of learning is aimed at discovering the exact variables that influence transfer. One of the variables that may significantly influence transfer is the type of teaching strategy used.

Guidelines for teaching for transfer include: (1) maximize the similarity between teaching and the ultimate testing situation; (2) provide adequate experience with the original task, (extensive practice on the original task increases the likelihood of positive transfer to a subsequent task); (3) provide for a variety of examples when teaching concepts and principles; (4) label or identify important features of a task; (5) ensure that general principles are understood before expecting much transfer (Ellis, 1965).

The tutorial pathway in CAI facilitates transfer by not only presenting the desired content, but by also providing exercises to reinforce important points and branching for remediation. Videotape Instruction simply presents the content.

Definition of Terms

For the purpose of this study, the following definitions were used:

1. Computer Assisted Instruction (CAI) - applications in which a computer is used to assist in the instruction of students. CAI involves a dialogue between a student and a computer program which informs the student of mistakes (and accuracies) as they are made; one student interacting with one machine (Hasset, 1984). In this study, CAI, refers to A Software Guide to Physical Examination, Eyes, Ears and Nose, produced by J. B. Lippincott (1987). The tutorial pathway includes an instructional section, internal quizzes and branching for remediation.

2. Videotape Instruction - a teaching strategy which requires a student to view a videotape. In this study Videotape Instruction refers to A Visual Guide to Physical Examination, module two A (The Eye) and module two B (Ear, Nose, & Sinuses) produced by J. B. Lippincott (1983).

3. RN Student - a student presently licensed as a registered nurse, who is pursuing a Bachelor of Science degree in nursing.

4. Cognitive Learning - the amount of knowledge acquired as a result of a teaching strategy. Cognitive learning was measured by post-test scores on the examination of eye, ear and nose (Appendix B, C, & D).

5. Retention - the amount of knowledge retained related to a teaching strategy after a period of five weeks. Retention was measured by post-test scores on the examination of the eye, ear and nose (Appendix B).

6. Transfer of Learning - the extent to which students can apply (transfer) theoretical knowledge to actual situations. Transfer of learning was measured by two separate rating scales (Appendix E & F). Students were asked to perform an examination of the eye, ear & nose and then were evaluated on their performance.

Assumptions

For the purpose of this study it was assumed that:

1. Students were able to make accurate judgments about their overall satisfaction with CAI at the time the questionnaires were administered.

2. Transfer of learning can be measured by using a check list form to evaluate the student's ability to

demonstrate the examination of the eye, ear and nose.

3. The CAI program and the Videotape Instruction utilized in this study were high quality programs and presented identical content.

4. The CAI program was an example of a mastery teaching strategy and the Videotape Instruction was not a mastery teaching strategy.

Limitation

For the purposes of this study the following limitation was identified:

The sample size and the fact that the sample was obtained from only one educational institution of higher learning may limit the generalizability of results of the study to other similar situations.

Literature Review

Despite the increased use of CAI, many questions have yet to be answered regarding its effectiveness as a teaching strategy. Several studies have compared CAI to traditional teaching strategies and examined cognitive learning consequences, however the results were inconclusive. Few studies have examined transfer and retention consequences and no studies have compared CAI to Videotape Instruction.

Huckabay, Anderson, Holm and Lee (1979) explored the cognitive, affective, and transfer of learning

consequences of CAI. The experimental group consisted of 14 graduate nurse practitioner students who were taught by lecture, followed by CAI. The control group included 17 nurse practitioner students who were taught by means of lecture-discussion. The findings revealed that there was a significant differences between pre-test and post-test scores in cognitive learning, with the CAI group attaining a significantly higher score. With regard to transfer of learning there was no a significant difference, however the trend observed was in the predicted direction. The third hypothesis regarding affective behaviors was not supported.

The effects of CAI and lecture upon knowledge, retention, and attitudes of baccalaureate nursing students were studied by Gaston (1988). An experimental two-group post-test design with a second post-test was used. The CAI group used an interactive tutorial which includes an instructional section, internal quizzes and branching for remediation. The lecture group was presented the same content using transparencies. Phase 1 data collection used 43 students consisting of 19 in the CAI group and 24 in the lecture group. Phase 2 (eight months later) data collection sample retained 13 in the CAI group and 16 in the lecture group. Attitudes were measured at Phase

1 and Phase 2. There was no significant difference in knowledge or retention between the experimental and control group. Student's attitudes toward CAI were positive. The researchers concluded that CAI is as effective as lecture for learning knowledge and retention.

Day and Payne, (1987) compared two teaching strategies utilized to teach health assessment content: CAI and traditional lecture method. The design of the investigation was quasi-experimental (n=99), incorporating two experimental treatments applied to two groups on two occasions. The experimental treatments were CAI and traditional lecture presentation. No significant difference was found between groups on cognitive performance as measured by written and practical examination scores. In addition, findings indicated that there was not a significant difference between groups on time spent meeting the learning objectives. The researchers concluded that CAI is as effective as the traditional lecture method in learning health assessment content, but CAI did not prove to be a positive instructional method as assessed by the attitude questionnaire.

Garret and Ashford (1986) assessed the effectiveness of CAI as an alternative to lectures and

seminars for internal medicine residents during their rotations in various subspecialties. Participants in the study included 14 internal medicine residents in rotations on the oncology service of a large hospital. Participants were presented with a patient simulation and asked to select various options and interventions. The interventions were chosen by the students from a list of 29 options that represented a range of diagnostic and therapeutic items. A varying number of options were correct in each case. The test was graded with a weighted scoring system ranging from +5 for a vital item to -5 for a contraindicated selection. The residents' mean pre-test score was -20.1, and mean post-test score was +31.9. The difference between the scores was statistically significant ($p<.01$). Twelve residents increased their scores on the post-test, one decreased his score on the post-test, and one showed little change. The study supports the use of employing CAI to provide a core of self-taught material for a clinical subspecialty rotation for medical residents.

Fincher, Abdulla, Sridharan, Gullen, Edelsbery and Henke (1987) conducted a study to determine whether a series of weekly seminars was superior to a self-study interactive computer program in teaching the basic skill of EKG interpretation to third year medical

students. Students were randomly assigned to either the seminar or computer group. Thirty-four students attended seminar which met one hour per week for six weeks with a cardiologist who was highly regarded for skill in both electrocardiography and teaching. Thirty-seven students were assigned to the computer group and used an interactive computer program which was rewritten by two of the authors and was designed to teach EKG interpretation. There was not a statistically significant difference between the students' scores in the computer and seminar groups; the trend however, was toward superiority of the CAI program.

Field testing of a set of flexible CAI programs to supplement more traditional approaches to a unit of instruction on respiratory assessment for undergraduate nursing students was performed by Bratt and Vockell (1986). An entire class of 15 freshman nursing students used the respiratory assessment CAI program as part of their scheduled assignments for that unit. The control group consisted of the 85 students (several sections), who had taken the same course the previous semester. The experimental group used the CAI material for the respiratory unit only. They used one, non-CAI method for the unit on basic assessment concepts. The

control groups did not utilize CAI at all. It was hypothesized that if CAI materials augmented learning, the experimental students would be expected to perform no better than the control group students on the first test covering basic assessment, but would perform significantly better on the second test covering respiratory assessment. On the test covering basic assessment the experimental group had a mean of 88.67, which was above the control group's mean of 86.89, although it was not statistically significant. On the second test covering respiratory assessment the experimental students averaged 92.60, compared to control group's average of 83.39. Analysis of covariance indicated that this difference after using the CAI material was significant beyond the .001 level.

Blitzer and Boudreaux (1969) conducted a nursing study which compared the traditional approach in learning maternity nursing to CAI. Results showed no significant differences between the groups on learning. Both groups learned significantly, but the CAI group spent a maximum of 50 hours compared with the 84 hours spent by the control group for learning the same material.

Belfry and Winne (1988) utilized qualitative and meta-analytic techniques to synthesize research

findings from 11 independent studies of CAI in nursing education. The results of this study, in combination with those previously reviewed, revealed that CAI is mostly effective for student achievement when it is used to supplement other forms of instruction. Of the 11 studies reviewed, 10 measured students' achievement. Four of the ten studies reported statistically significant differences between CAI and traditional methods. All of the studies reported that the average score for students who participated in the CAI was higher than that for students who had traditional instruction, although the results were not statistically significant. In the other two studies, students who had conventional instruction had higher scores on the average than the students who had CAI. Overall, the results suggested that CAI was more effective than other methods.

This study was designed to extend the research on the use of CAI. It was unique in three ways: 1) it was the first study in which CAI was compared to Videotape Instruction; 2) it was the first experimental study of CAI which utilized a repeated measures design; and 3) it was the first study in which the sample consisted of RN students returning to pursue a Bachelor of Science degree in nursing.

Hypothesis

Three hypotheses were developed based on the theories of mastery learning and transfer of learning. Given two groups of RN students, each taught by alternating CAI and Videotape Instruction:

1. There will be no significant difference in cognitive learning of RN students instructed by CAI or Videotape Instruction.
2. There will be no significant difference in retention of knowledge of RN students instructed by CAI or Videotape Instruction.
3. There will be no significant difference in the ability of RN students instructed by CAI or Videotape Instruction to transfer what they have learned demonstrated by their ability to perform selected portions of a physical examination.

Chapter 2

Methodology

The purpose of this study was to compare the effects of CAI with Videotape Instruction on cognitive, transfer and retention learning consequences of registered nurses pursuing a bachelor's degree in nursing. An experimental repeated measures design with counterbalancing was used to compare teaching strategies. One of the advantages of this design was that each student was exposed to both teaching strategies and tested for a response to each treatment (Burns, 1987). "The strength of the true experiment over other methods lies in the fact that the experimenter can achieve greater confidence in the genuineness and interpretability of relationships because they are observed under carefully controlled conditions" (Polit and Hunglar, 1987, p. 120).

Sample

The target population for this study consisted of registered nurses pursuing a bachelor's degree in nursing, who were required to take a course in physical assessment. The accessible population consisted of registered nurses enrolled in a sophomore level physical assessment course at a southeastern university in the United States. The sample consisted of 18

registered nurses who were enrolled in a sophomore level physical assessment course.

Setting

The setting for this study was a school of nursing in a southeastern university in the United States. The school of nursing maintains accreditation by the state's board of nursing and the National League for Nursing and has a present enrollment of 200 sophomore through senior level nursing students.

Tools

The instruments associated with this study were developed by the researcher and subjected to extensive evaluation to ascertain validity and reliability. Test A measured retention. Test B and Test C measured cognition and Test D and Test E were checklists utilized to measure transfer of learning.

Test A (Appendix B) was a criterion-referenced mastery test developed to assess the student's knowledge of the procedures, manipulations, interpretations of findings and positions necessary to perform an examination of the eye, ear and nose. Questions were based on material presented in A Guide to Physical Examination and History Taking, (J. P. Lippincott, 1987). Thirty-one multiple choice, true-false and matching items written at the knowledge and

comprehension level of the cognitive domain were included in Test A. Each question was assigned a value of one point, and the score for Test A ranged from 0-31.

Test B and Test C (Appendix C and D) were alternative forms of Test A, however the content of Test B was restricted to questions involving the examination of the eye and the content of Test C was restricted to questions involving the examination of the ear and nose. Test B and Test C each consisted of 15 and 16 multiple choice, true-false and matching items and took approximately 20 minutes to complete.

Test D and Test E (Appendix E and F) were evaluation tools utilized to measure transfer of learning. Test D included critical components of the eye examination and test E included critical components of the ear and nose examination. Possible scores for Test D and Test E ranged from 0-18.

"Content validity is important for all measures and is especially of interest for instruments designed to assess cognition" (Waltz, 1984, p. 142). In order to validate the content included in Tests A, B and C, two members of a nursing faculty who teach physical assessment were asked to review each question and determine whether it should (1) remain as is, (2)

retain but revise and indicate how, or (3) delete. Based on this review 10 items were revised.

Test D and E have been used at the university serving as the setting for this study for the past five years to evaluate the ability of nursing students to perform an examination of the eye, ear and nose. The content included in Test D and Test E was based on material presented in A Guide to Physical Examination and History Taking (J. P. Lippincott, 1987).

Test A, B, and C were pilot tested on three separate groups of sophomore nursing students who had studied physical assessment in the fall of 1987. Pilot testing was conducted at the university serving as the setting for this study. The objective of pilot testing was to determine the reliability of the test items of the three instruments and to revise the tests if indicated prior to the actual study.

The researcher forwarded written instructions to the clinical instructors responsible for each group involved in pilot testing. The instructors were asked to administer each test to the same group of students on two separate occasions. The time period between the first and second administration of the test was two weeks. Group 1 received Test A, Group 2 received Test B and Group 3 received Test C. The results of the

pilot test are presented in Table 1.

Based on the results of the pilot study, revision of all three tests were indicated. The students' overall scores improved the second time Test A, B and C were administedred, however, the reason for this is unclear. It is possible that the students had discussed specific test question with one another or reviewed the content prior to the second administration of the test. The reliability of the test scores varied. According to Gronlund (1985), "any particular instrument may have a number of different reliabilities, depending on the group involved and the situation in which it is used" (p. 87).

During the pilot study the following criteria was adopted to guide this phase of the revision process:

1. Items in which all students either answered correctly or incorrectly were revised. The rationale for this decision was that any item passed by all students or missed by all students added nothing to the measurement of differences among the group (Grunland, 1985).
2. Distracters not selected by anyone were eliminated or revised during the revision process. The rational for this decision was that in a properly constructed multiple-choice item, each distracter should be

Table 1

Pilot Study Data From Test A, B & C.

	Time 1	Time 2
Test A		
Eye, Ear and Nose Items		
M	16.00	17.20
SD	3.26	4.07
Possible Range	0 - 31	0 - 31
Actual Range	10 - 21	10 - 24
KR20	.52	.73
P_o	.90	
N = 10		
Test B		
Eye Items		
M	8.88	8.63
SD	2.03	2.45
Possible Range	0 - 15	0 - 15
Actual Range	5 - 11	5 - 12
KR20	.43	.54
P_o	.88	
N = 8		
Test C		
Ear and Nose Items		
M	8.57	7.71
SD	3.26	3.59
Possible Range	0 - 16	0 - 16
Actual Range	4 - 13	2 - 12
KR20	.75	.82
P_o	.85	
N = 10		

selected by some pupils (Grunland, 1985).

"Item-analysis procedures used with norm-referenced tests are not directly applicable to criterion-referenced mastery tests since the purpose of a criterion-referenced test is to describe what a student can do, rather than to discriminate among them" (Grunland, 1986, p. 254). Therefore, the more traditional indexes of discriminating power were of little value in judging the adequacy of test items.

Since the range of variability in a criterion-referenced measurement is less variable than in a norm-referenced measurement, reliability is determined by non-parametric procedures versus parametric correlational analysis (Waltz, 1984). One non-parametric approach that has been identified to assess the stability of criterion-referenced test results for the test-retest procedure is P , "which is the proportion of persons or objects consistently classified in the same category on both measurement occasions" (Waltz, 1984, p. 189).

During the pilot study, students were classified as masters if they obtained a grade of 70 or better, and non-masters if they obtained a score of less than 70. Seventy in this instance was referred to as the "cut score". A cut score of 70% was established by the

researcher since a minimum grade of 70% is required in all nursing courses in order to continue in the nursing program. Waltz (1986) "cautions the researcher that unless the standard or cut score has high validity, the computation of a reliability index has little significance. A high reliability index in a situation in which the standard has been improperly set may mean only that the measure consistently classifies objects incorrectly" (p. 188). Tests A, B, and C classified nursing students with a relatively high degree of consistency as reflected in Table 1.

An estimate of interrater reliability for test D and E was determined by having two graduate nursing students simultaneously observe and rate five nursing students as they demonstrated their ability to perform an examination of the eye, ear and nose. The percentage of agreement between the two raters was then calculated. The total percentage agreement between the two raters was 91%. "In most instances knowing the percentage of times two raters agreed is more informative to an investigator than the percent of variance explained by correlation-like procedures (Baer, 1977, p. 117).

A demographic data sheet (Appendix G) was utilized to determine if the extraneous variables of age,

educational background, years spent in nursing, work status, experience with a computer at home or at work, and prior experience with CAI affected the dependent variables: cognitive learning, transfer of learning and retention. Participants were also asked to review a statement and indicate whether they agreed or disagreed with the statement and to what degree. There were four statements which pertained to the following variables: study time, interest, reinforcement exercises and teaching physical assessment. At the end of the questionnaire, participants were asked what method of instruction they preferred and why.

Procedure

Approval to conduct this study was obtained from the Committee for the Protection of Human Subjects of the School of Nursing, at the university serving as the setting for this study. Permission to conduct research was also obtained from the School of Nursing and the faculty member responsible for the sophomore physical assessment course at the participating university. Measures to protect the confidentiality of participants were instituted throughout this study.

On day one of the study, the researcher explained to all prospective participants that the goal of the

research project was to determine which teaching strategy was more effective, CAI or Videotape Instruction, for teaching physical assessment. Following a brief explanation of the study, the researcher provided all potential participants with a copy of the informed consent letter (Appendix A) which explained in detail what was required of participants. The researcher emphasized that participation was voluntary and that participants could withdraw from the study at any time without repercussions. The researcher also explained to the students that no names would be used on test instruments, only their social security numbers. Immediately following the overview of the study by the researcher, participants completed Test A and then were randomly assigned to Group 1 and Group 2 completing Phase 1 of the study.

On day two of the study, Group 1 utilized CAI for the examination of the eye, and Group 2 utilized Videotape Instruction for the examination of eye. Both groups were given Test B immediately following instruction. On day three of the study, Group 1 utilized the Videotape Instruction for examination of the ears, nose and sinuses and Group 2 utilized CAI for the examination of the ears, nose and sinuses. Both

groups received Test C immediately following instruction and were also asked to complete a demographic data sheet which included questions on teaching strategy preference. This completed Phase 2 of the study.

Participants in both groups were given the opportunity to practice examining the ear, eye and nose on their laboratory partner on day four and day five of this study. When the students verbally indicated that they had mastered the necessary component of the eye, ear and nose examination, they were asked to demonstrate their ability to perform this examination on another student while a registered nurse, who had completed a graduate level course in physical assessment, evaluated their performance. The evaluator utilized Tests D and E to document the ability of the individual student to examine the eye, ear and nose. This completed Phase 3 of this study.

Phase 4 of this study occured five weeks following CAI and Videotape Instruction when participants in Group 1 and Group 2 were asked to complete Test A for a second time in order to assess retention. This completed the data collection process.

Data obtained from the pilot study and the larger study was analyzed using the Statistical Package for

Chapter 3

Results

The purpose of this research study was to compare the effects of Computer Assisted Instruction (CAI) and Videotape Instruction on knowledge, transfer of learning and retention consequences of RN students returning to pursue a Bachelor of Science degree in nursing. Registered nurse (RN) students enrolled in a physical assessment course at a single school of nursing consented to take part in this study. Students were randomly assigned to two groups. Group 1 used the CAI for the examination of the eye and the Videotape Instruction for the examination of the ear and nose. Group 2 used the CAI for the examination of the ear and nose and the Videotape Instruction for the examination of the eye. Students were asked to complete a pretest and then tested again following each method of instruction. Five weeks following instruction the students completed a final test. Students in both groups were asked to demonstrate the examination of the eye, ear and nose, and were evaluated on their performance.

Analysis

The Mann Whitney U Test, significant at $p<.05$, was performed to test for significant differences between

the groups on the dependent variables: cognitive learning, transfer of learning and retention. It was necessary to use the Mann Whitney U Test because of the smallness of the sample size. The Mann Whitney U Test is the most powerful of the non-parametric tests when the assumptions of the t-test are violated. It can be used with samples as small as six (Burns, 1987).

Cognitive learning, the amount of knowledge acquired as a result of a teaching strategy, was measured by post-test scores on Tests B and Test C. Test B included content on the examination of the eye, and Test C included content on the examination of the ear and nose. Scores on Test B and Test C for Group 1 were then compared to scores on Test B and Test C for Group 2. The Mann Whitney U was the statistical test used to test for significant differences between Group 1 and Group 2.

Transfer of learning, the extent to which students can apply theoretical knowledge to actual situations, was measured by two separate rating scales, Test D and Test E. Test D included content on the examination of the eye, and Test E included content on the examination of the ear and nose. Scores on Test D and test E for Group 1 were then compared to scores on Test D and Test E for Group 2. The Mann Whitney U was the statistical

test used to test for significant differences between Group 1 and Group 2.

Retention, the amount of knowledge retained related to a teaching strategy after a period of five weeks, was measured by post-test scores on Test A. Test A included content on the examination of the eye, ear and nose. Scores on test questions pertaining to the examination of the eye for Group 1 were then compared to scores on test questions pertaining to the examination of the eye for Group 2. The Mann Whitney U was the statistical test for significant differences between Group 1 and Group 2. A second retention test was performed comparing scores on test questions pertaining to the examination of the ear and nose for Group 1 to scores on test questions pertaining to the examination of the ear and nose for Group 2. Demographic data were analyzed using frequency statistics. Summations of the qualitative comments were made.

Findings

The sample for this study consisted of 18 registered nurses completing course requirements for a bachelor's degree in nursing, who were enrolled in a course in physical assessment. There were eight students in Group 1 and ten students in Group 2.

Nearly all of the participants were under 40 years of age (94%) and all were female. The majority of the subjects (66%) were graduates from diploma schools, and the remainder were graduates from associate degree programs (33%). Three quarters of the subjects were employed full time (75%) and worked as a registered nurse for greater than five years (56%). Demographic data on participants is included in Table 2. Less than half (41%) of the participants had a personal computer at home and slightly more than half (47%) of the participants had used a computer at work. However, more than half (52%) of the participants had experienced some form of CAI prior to this study.

Table 2

Demographic Data of Participants

Variable	Mean	SD	Range
Age	31.4	1.45	23-43
Years of experience	6.9	4.40	1-14
Hours worked per week	38.3	7.29	24-56

N = 18

In Phase 1, both groups completed the pre-test, Test A. In Phase 2, each group studied physical assessment, however the method of instruction varied. Group 1 utilized CAI for the examination of the Eye, and Group 2 utilized Videotape Instruction for the examination of the Eye. Group 1 then utilized Videotape Instruction for the examination of the Ear, and Group 2 utilized CAI for the examination of the Ear. Both Group 1 and Group 2 completed a post-test (Test B and Test C) following each method of instruction.

In Phase 3, a research assistant evaluated the students' ability to demonstrate the examination of the eye, ear and nose following CAI and Videotape Instruction and practice. All eight of the students in Group 1 participated in Phase 3 of the study, however, only five of the participants in Group 2 participated in Phase 3. Several students commented that they felt uncomfortable demonstrating the eye, ear and nose examination in front of an evaluator that was not the course instructor.

Five weeks following instruction all 18 registered nurse students agreed to complete Phase 4 of the study. In Phase 4 the retention test, which was Test A, was administered for the second time.

The instruments associated with this study were developed by the researcher and subjected to extensive evaluation prior to implementation. As may be seen in Table 3, the reliability estimates for Tests A and B were low. Most of the students who took Test A (pre-test) never had a physical assessment course and may have had to guess to answer specific questions about the examination of the eye, ear and nose. Test A had a higher reliability estimate when it was given five weeks following instruction as the retention test. Test B reliability estimate during the pilot study was low, and despite revision it still was low during the actual study. The reliability estimate for Test C was acceptable.

Results from Test A, the pre-test, revealed that there were no significant differences between groups with regard to their initial knowledge of techniques utilized to examine the eye, ear and nose. The groups were therefore considered equal initially.

The first hypothesis stated that there would be no significant difference in knowledge of RN student instructed by CAI or Videotape Instruction. The hypothesis was not rejected at the .05 level of significance.

Table 3

Reliability of Test A, B, and C used evaluate Cognitive, Transfer and Retention Consequences of CAI and Videotape Instruction.

Test	Group 1 n = 8	Group 2 n = 10
Test A (Pre-test)		
M	12.1	13.5
SD	2.0	2.5
Possible Range	0 - 31	0 - 31
Actual Range	9 - 15	8 - 17
KR20	.20	.17
Test B (Cognition)		
M	11.13	9.60
SD	2.42	1.62
Possible Range	0 - 16	0 - 16
Actual Range	7 - 15	7 - 12
KR20	.69	.05
Test C (Cognition)		
M	9.6	8.40
SD	3.0	3.72
Possible Range	0 - 16	0 - 16
Actual Range	5 - 14	3 - 14
KR20	.75	.84
Test A (Retention)		
M	23.1	22.6
SD	3.9	3.8
Possible Range	0 - 31	0 - 31
Actual Range	17 - 28	17 - 29
KR20	.76	.71

The second hypothesis stated that there would be no significant difference in retention of knowledge of RN students instructed by CAI or Videotape Instruction. The hypothesis was not rejected at the .05 level of significance.

The third hypothesis stated that there would be no significant difference in the ability of RN students instructed by CAI or Videotape Instruction to transfer what they had learned demonstrated by their ability to perform selected portions of a physical examination. The hypothesis was not rejected at the .05 level of significance. The statistical results of each hypothesis are presented in Table 4.

Table 4

Mann Whitney U test for significant differences on Cognitive, Transfer and Retention Learning Consequences.

Test	Group	Mean Rank	U	P
Pretest Test A	1	7.63	25.0	0.17
	2	11.0		
Cognitive Test B	1	11.44	24.5	0.16
	2	7.95		
Cognitive Test C	1	10.44	32.5	0.50
	2	8.75		
Transfer Test D	1	6.13	13.0	0.30
	2	8.40		
Transfer Test E	1	6.88	19.0	0.88
	2	7.20		
Retention Test F (Eye Questions)	1	9.81	37.5	0.83
	2	9.25		
Retention Test F (Ear & Nose Questions)	1	9.81	37.5	0.82
	2	9.25		

n = 8 (Group 1)
n = 10 (Group 2)
*p<.05

Additional Findings

This study explored which method of instruction students preferred. On the demographic data form, each student was asked specific questions regarding the two forms of instruction. The majority of the participants (88%) agreed that reinforcement exercises in the CAI program were very helpful. However, the students were evenly divided over whether or not CAI required less study time following instruction. Most students indicated that CAI was more interesting than Videotape Instruction, but that Videotape Instruction was an effective way of teaching physical assessment because one could actually see a physical assessment being done. Overall, the majority of the students preferred CAI (58%) to Videotape Instruction (41%).

Students were asked which method of instruction they preferred and why. The majority of the students who preferred CAI commented that they like the self paced, and self test:

> "I liked the CAI because it was self paced, required attention and had a self test. With Videotape Instruction my mind may wonder if I had a long day at work and it doesn't have self quizzes."

Students who preferred Videotape Instruction shared the following concerns:

> "I preferred the Videotape Instruction because I could actually see an exam being done. One could hear an instructor reinforcing information. The computer presents information briefly and then tests from specific works and numbers given for a short moment. It doesn't seem effective to me."

In summary there were no significant differences in cognitive, transfer or retention learning consequences as a result of the type of teaching strategy, CAI or Videotape Instruction for teaching physical assessment of the eye, ear and nose. The majority of students, however preferred CAI. Conclusions and recommendations based on this research study are discussed in Chapter 4.

Chapter 4

Discussion

Conclusions

The purpose of this research study was to compare the effects of Computer Assisted Instruction (CAI) and Videotape Instruction on cognitive, transfer and retention learning consequences of RN students returning to pursue a baccalaureate degree in nursing. Mastery of Learning Theory and Transfer of Learning Theory provided the theoretical framework for this research study. It was postulated that there would be significant differences between groups on cognitive, transfer and retention learning consequences as a result of the type of teaching strategy used.

Three hypotheses were tested to determine if the method of instruction resulted in significant differences in cognitive, transfer and retention learning consequences of RN students returning to pursue a baccalaureate degree in nursing. Five instruments were used in this study. Test A measured retention and consisted of 31 multiple choice items. Test B and Test C measured cognition and consisted of 15 and 16 multiple choice items respectively. Test D and Test E were checklists used to measure transfer of learning and each checklist consisted of 18 items. The

Mann Whitney U Test, significant at $p<.05$, was performed to test for significant differences between groups on the dependent variables. The major findings of this study were that there were no significant differences between the use of CAI and Videotape Instruction on cognitive, transfer or retention of learning consequences. Demographic information was unremarkable for trends. The majority of the sample was composed of female nurses under the age 40, who work full time, and have worked as a RN for greater than five years.

For the purpose of this study, CAI was assumed to be an example of a mastery teaching strategy. CAI incorporates the principles of mastery learning as evident in the following features: the student responds in an active fashion to the material; the student receives immediate feedback on the correctness of his response; the student proceeds at his own pace and is allowed as much time as he needs. Videotape Instruction was considered to be an example of a nonmastery teaching strategy since the student's role in Videotape Instruction is a passive process. There is no direct student interaction, no feedback mechanism, and it is not self paced.

Ellis's (1965) theory of Transfer of Learning provided the theoretical basis for evaluating Transfer of Learning. Transfer of Learning Theory proposes that when students are provided with the opportunity to practice in situations that are similar to actual situations and when they have mastered the content presented, they will be able to transfer and apply theoretical or conceptual knowledge to a case study or actual patient care situations. Videotape Instruction simply presents the content. CAI facilitates transfer of learning by not only presenting the desired content, but by also providing exercises to reinforce important points and by providing branching for remediation.

Mastery of Learning Theory and Transfer of Learning Theory provided the theoretical framework for a comparison between two alternative forms of instruction. It was postulated that there would be significant differences on cognitive, transfer and retention learning consequences based on whether the teaching strategy used incorporated the principles of mastery learning and transfer of learning. It was hypothesized that students who used CAI would score significantly higher on tests measuring cognitive, transfer and retention learning than the students who used Videotape Instruction. However, the findings

revealed that there were no significant differences in cognitive, transfer or retention learning consequences as result of the type of teaching strategy used. This study's findings would suggest that teaching strategies which incorporate the principle of Mastery of Learning and Transfer of Learning are not superior to teaching strategies that do incorporate the principles of Mastery Learning and Transfer of Learning.

Cognitive Learning

It was expected that the RN students who utilized CAI would score significantly higher on tests measuring cognition then the RN students who utilized Videotape Instruction. On the contrary, no difference was found. These findings are consistant with several studies which compared CAI and classroom instruction (Bratt & Vockell 1986; Blitzer and Boudreaux, 1969; Day and Payne, 1984; Huckabay, Anderson, Holm and Lee, 1979; Gaston, 1988). However, Conklin (1983) disputed these findings and found a significant increase in knowledge when CAI was compared to classroom instruction.

Transfer of Learning

It was also expected that the RN students who utilized CAI would score significantly higher on tests measuring Transfer of Learning then the RN students who

utilized Videotape Instruction. This study's findings revealed that regardless of the type of teaching strategy used, there was no difference among the RN students in their ability to perform selective portions of the examination of the eye, ear and nose. Factors such as pre-class preparation and clinical practice time were not controlled for and may have significantly influenced the RN students' ability to transfer what they learned. These findings are not consistant with the findings of Huckabay, Anderson, Holm and Lee (1979), who found that students who used CAI had a statistical significant increase in their scores on a test that measured their ability to transfer knowledge when compared to students who were taught by lecture method alone. However, in this study, CAI was used to supplement nursing lectures.

Five RN students elected not to participate in Phase 3 of the study which included demonstrating the eye, ear and nose examination while being evaluated by a research assistant. As a result there were eight RN students in Group 1 and only five RN students in Group 2. In order to perform a Mann Whitney U Test there should be at least six subjects per group (Burns, 1987), thus one of the assupmptions of the Mann Whiney U Test had been violated.

Retention of Learning

There was not a significant difference in retention of learning based on the type of teaching strategy used: CAI versus Videotape Instruction. These findings are consistant with several studies which compared CAI and classroom instruction (Day and Payne, 1984; Gaston, 1988). Day and Payne (1984) investigated retention by comparing the teaching strategies of lecture and CAI in two groups of nursing students, and found no statistical difference in retention of learning. Gaston (1988) measured retention eight months following instruction and found no significant difference in retention between the use of CAI and lecture with nursing students.

This study was unique in several ways. It was the first study done comparing CAI to Videotape Instruction and it was the first study in which participants were exposed to both methods of instruction and asked which method they preferred. Although the findings revealed that there was not a significant difference in cognitive, transfer and retention consequences of CAI and Videotape Instruction, CAI was proven to be as effective as Videotape Instruction. This has significant implications for nurse educators who are challenged to provide learning experiences which are

highly relevant, individualized and can accommodate students of varying academic backgrounds and learning styles. CAI becomes a plausible alternative when attempting to select an effective method of providing individualized instruction.

This study has implications for nurse educators who are interested in exploring effective teaching strategies to use when teaching physical examination techniques since this content is included at some level in all baccalaureate nursing programs. Based on the results of this study, CAI was proven to be as effective as Videotape Instruction when comparing cognitive, transfer, and retention learning consequences. A combination of both CAI and Videotape Instruction may significantly effect cognitive, transfer and retention learning, since the student would benefit not only from active process demanded in CAI, but would also be able to see a physical examination being performed.

Recently there has been an increase in the number of RN students wishing to earn their baccalaureate degree. RN students returning to school differ from generic students on demographic variables such as age, number of semesters completed at a school, previous

degrees obtained, past nursing experiences and marital status. Many RN students, while pursuing a baccalaureate degree in nursing, are also working full time and have family responsibilities. Trying to meet the unique needs of the RN student is a challenge confronting nurse educators. CAI offers several advantages for the RN student: 1) work can be done independently at a time convenient for the RN student, 2) programs are self paced, permitting the RN student to proceed at his or her own learning rate, 3) there is branching for remediation if additional review is necessary.

The study had several limitations that must be considered in its evaluation. The smallness in the sample size and the fact that the sample was obtained from only one educational institution may limit the generalizability of the results of the study.

The findings are also limited due to the content presented and the specific software used. It was assumed that the CAI program and the Videotape Instruction utilized in this study were high quality programs which presented indentical content.

Despite several revisions, the reliability of Test B was low during the actual study. However the design of the study was such that cognitive learning was essentially measured twice during Phase 2. The first

time was when Group 1 completed the CAI on the examination of the eye and then completed Test B, and Group 2 viewed the Videotape Instruction on the examination of the eye and then completed the Test B. The Mann Whitney U was used to test for significant differences on the scores on Test B between Group 1 and Group 2. Cognitive learning was tested for a second time when Group 1 completed the Videotape Instruction on the examination of the ear and nose and then completed Test C, and Group 2 completed the CAI on the examination of the ear and nose and then completed Test C. The Mann Whitney U was used to test for significant differences between scores on Test C between Group 1 and Group 2. The reliabilty of Test C was acceptable, therefore it can be assumed that there were no differences in cognitive learning between CAI and Videotape Instruction.

Recommendations

Several recommendations can be made as a result of completing this research study. The study should be replicated using the same design with a larger population. Because of the smallness of the sample used in this study, the results could not be generalized to RN students in other settings. A larger sample would provide for greater generalizability.

It is suggested that the content presented should be something other then physical assessment such as pharmacology, nutrition or research since several students commented that the only reason they preferred the Videotape Instruction was because they could actually see a physical examination being done. Future research could determine whether or not there would be a significant difference in cognitive, transfer and retention learning consequences if both CAI and Videotape Instruction were used to teach physical examination techniques.

When attempting to measure transfer of learning it is suggested that other variable such a practice time, course preparation time and student motivation should also be explored. These variables may affect transfer of learning.

In conclusion, this study revealed that there were no significant differences in cognitive, transfer and retention consequences of CAI and Videotape Instruction, however, CAI was proven to be as effective as Videotape Instruction. Nurse educators challenged with teaching RN students with diverse educational backgrounds and varied experiences may find that CAI is one method of meeting the unique needs of the RN student.

Bibliography

Bates, B. (1987). A Guide to Physical Examination and History Taking. Philadelphia: J. B. Lippincott.

Belfry, M. J. & Winnie, P. H. (1988). A review of the effectiveness of computer assisted instruction in nursing education. Computers in Nursing, 6 (2), 77-84.

Blitzer, M. D. & Boudreaux, M. C. (1969). Using a computer to teach nursing. Nursing Forum, 8 (3), 234-254.

Block, J. H. (1971). Mastery learning: theory and practice. New York: Holt, Rinehart and Winston.

Bloom, B. S. (1976). Human characteristics and school learning. New York: McGraw-Hill.

Burns, N. & Grove, S. K. (1987). The practice of nursing research conduct, critique and utilization. Philadelphia: Saunders.

Bratt, E. & Vockell, E. (1986). Using computers to teach basic facts in the nursing curriculum. Journal of Nursing Education, 25 (6), 247-251.

Cooper, S. S. (1982). Methods of teaching - revisited the lecture. The Journal of Continuing Education in Nursing, 13 (4), 39-41.

Day, R. & Payne, L. (1987). Computer-managed instruction; an alternative teaching strategy. Journal of Nursing Education, 26 (1), 30-36.

Ellis, H. (1965). The transfer of learning. New York: Macmillan.

Fincher, R. M., Abdulla, A. M., Sridharan, M. R., Gullen, W. H., Edelsberg, J. S. & Henke, J. S. (1987). Comparison of computer-assisted and seminar learning of electrocardiogram interpretation by third-year students. Journal of Medical Education 62 693-695.

Garret, T. J. & Ashford, A. R. (1986). Computer-assisted instruction in patient management for internal medicine residents. Journal of Medical Education 61, 693-695.

Gaston, S. (1988). Knowledge, retention, and attitude effects of computer-assisted instruction. Journal of Nursing Education 27 (1), 30-34.

Gronlund, N. E. (1981). Measurement and evaluation in teaching. New York: Macmillan.

Hasset, M. R. (1984). Computers and nursing education in the 1980's. Nursing Outlook 32 (1), 34-36.

Hebda, T. (1988). A profile of the use of computer-assisted instruction within baccalaureate nursing education. Computers in Nursing 6 (1), 22-29.

Huckabay, L. M., Anderson, N., Holm, & Lee, J. (1979). Cognitive, affective, and transfer of learning consequences of computer-assisted instruction. Nursing Research 28 (4), 228-233.

Marsh, G. & Price, B. J. (1987). A Software Guide to Physical Examination. Philadelphia: J. B. Lippincott.

Meadows, L. (1977). Nursing education in crisis: a computer alternative. Journal of Nursing Education, 16 (5), 13-21.

National League for Nursing. (1979). Characteristics of graduate education in nursing leading to the master's degree. New York: National League for Nursing.

Ostmoe, P. M. (1984). Learning style preferences and selection of learning strategies: consideration and implications for nurse educators. Journal of Nursing Education, 23 (1), 27-29.

Polit, D. F. & Hungler, B. P. (1987). Nursing research principles and methods (3rd ed.). Philadelphia: J. B. Lippincott.

Waltz, C. F., Strickland O. L. & Lenz E. R. (1986). Measurement in nursing research. Philadelphia: Davis.

Appendix A

LETTER TO PARTICIPANTS

Dear Nursing Student:

I am a graduate student in the School of Nursing at Old Dominion University. I would like to request your participation in a research study associated with my masters thesis. The purpose of this study is to compare learning using two types of instruction: videotape and computer assisted instruction (CAI).

One of the course requirements for the Lab component of Nursing Theories and Concepts (Nursing 260) is that you demonstrate your ability to perform a physical examination during the lab practicum. You are also required to successfully complete a comprehensive examination developed to test your mastery of terminology, procedures and techniques necessary to perform a physical examination. It is believed that participation in this study will enhance your ability to meet the course requirements.

If you agree to participate in this study you will be asked to complete a 31 item pre-test on Day 1 of the course which will take approximately 25-30 minutes to complete. On the second day of lab if you are in group 1, you will be asked to view the videotape instruction of the examination of the eye and take a 15 item post-test. You will then be asked to complete the computer assisted instruction on the examination of the ear and nose and complete a 16 item post-test. This procedure is exactly the same for members in group 2 with two exceptions: Instruction will occur on the third day of lab for group 2 and members will be asked to view the videotape instruction for the examination of the ear and nose and take a 16 item post-test and the computer assisted instruction for the examination of the eye and take a 15 item post-test. Both post-tests take approximately 10-15 minutes to complete and the questions asked are similar to questions that will be asked on your midterm and final. Both forms of instruction take place during class time.

On either the third or fourth day of lab, depending on group assignment, you will be practicing examining the ear, eye and nose on your lab partner. When you feel you have mastered the necessary components of the eye, ear and nose examination you will be asked to demonstrate your ability to perform this examination on another student while a graduate student evaluates your performance. The criteria utilized to evaluate performance is the same criteria that will be utilized by the nursing faculty during the lab practicum. It is hoped that this additional experience will better prepare you for the lab practicum.

Finally, during the last lab day prior to the final examination you will be given a 31 item test which will cover content on the examination of the eye, ear and nose. This test will take approximately 25-30 minutes to complete and may help you prepare for the final examination. You will also be asked to complete a brief 10 item questionaire asking you your preference regarding teaching methods.

All of the scores on the tests will remain confidential. Your instructor in Nursing 260 will not have access to your scores. Your scores on the individual tests and on the demonstration will not effect your course grade and you will not be individually identified in anyway.

Participation in the study is voluntary. Should you become uncomfortable in any aspect of the study, you may withdraw at any time without any repercussions. If you have questions about the study or the manner in which it is conducted you may contact me at (804) 424-6156. Results of this study will be gladly provided if requested. Your participation will be greatly appreciated.

Sincerely,

Linda McCormack-Miller

Appendix B

Test A

Directions:

Please do not write on this test. Use the opscan sheet to record your answers. Do not write your name, only your social security number on the opscan sheet. Please read each question carefully and select the best answer.

1. How many feet from the Snellen eye chart should your position the patient when testing visual acuity?

a. 10 feet
b. 20 feet
c. 30 feet
d. 40 feet

2. The upper eye lids should overlap the iris, not the pupil.

a. True
b. False

3. When you press on the nasolacrimal sac, the material causing the duct blockage will emerge through the:

a. sclera
b. nasolacnmal duct
c. puncta
d. nose

4. When examining the eyelids inspect for all of the following EXCEPT:

a. edema
b. tenderness
c. lesions
d. color

5. To assess extraocular movements of the eye the following procedure should be followed:

a. slowly bring a pencil or other small object from the periphery into the field of vision from 8 different directions, and asked the patient to say "now" as soon as it appears in his/her vision field.
b. ask the patient to follow your pencil as you move it in toward the bridge of the patient's nose from 18 inches away.
c. ask the patient to follow your finder or pencil as you move it through the six cardinal directions of gaze.
d. ask the patient to follow your pencil as you move it in a circle.

6. A clinical test of peripheral vision is called:

a. accommadation
b. cover-uncover test
c. confrontation test
d. consensual reaction test

7. A cover/uncover test is performed to assess:

a. the ability of the eye to converge
b. the extraocular muscles of the eye
c. the position and alignment of the eyes
d. visual fields

8. When performing an opthalmospic examination the eyes should be examined from a position of about:

a. 5 inches away from the patient and 15 degrees lateral to the patient's line of vision
b. 15 inches away from the patient and 5 degrees lateral to the patients' line of vision
c. 15 inches away from the patient and 15 degrees lateral to the patient's line of vision
d. 20 inches away from the patient and 20 degrees lateral to the patient's line of vision

9. Which of the following may result in absence of a red reflex:

a. opacity of the lens such as cataracts
b. opacity of the vitreous body
c. a and b
d. neither a nor b

10. Structures examined with the opthalmoscope include:

a. optic disc and cup, optic chiasm, and retinal arteries and veins.
b. optic disc and cup, retinal arteries and veins, and macula
c. retinal arteries and veins, optic tract and macula
d. optic chiasm, retinal arteries and veins, and optic tract.

11. When performing an ophthalmoscopic examination you should use your right hand and right eye to examine the patient's right eye.

a. True
b. False

12. When inspecting the pupils the examiner should note the size, shape, and the equality of the pupils and test for which of the following reactions using an oblique light?

a. the direct reaction
b. the consensual reaction
c. Nystagmus
d. both a and b
e. all of the above

13. Which of the following statements is FALSE regarding differentiating between arteries and veins during an ophthalmoscopic examination:

a. arterioles are light red and smaller than veins
b. veins are darker as well as larger than arterioles
c. veins are darker and the same size as arterioles
d. the light reflex of the arterioles is brighter than that of the veins

14. The fovea centralis is located on the:

a. macula
b. lens
c. physiologic cup
d. optic disc

15. When performing an opthalmoscopic examination, a normal optic disc may be seen as:

a. orange glow in the pupil
b. yellowish orange to creamy pink, oval or round structure
c. red reflex

16. When examining the adult ear, the auricle should be grasped firmly but gently and pulled:

a. upward, back and slightly out
b. downward, back and slightly out
c. upward, back and slightly in
d. downward, back and slightly in

17. When examining the ear canal, the largest ear speculum that the canal will accommodate should be used:

a. True
b. False

18. All of the following are landmarks of the tympanic membrane EXCEPT:

a. cone of light
b. umbo
c. semicircular canals
d. pars tensa
e. pars flaccida

19. What is the proper procedure for performing the Weber Test:

a. place the base of a lightly vibrating tuning fork on the mastoid bone
b. place the base of a lightly vibrating tuning fork firmly on top of the patient's head or mid forehead
c. place the base of a lightly vibrating tuning fork on the mastoid bone while occulating one ear at a time
d. place the base of a lightly vibrating tuning fork on the temporal area

20. A normal response to the Rinne test would be:

a. bone conduction is greater than air conduction
b. bone conduction is the same as air conduction
c. air conduction is greater than bone conduction

21. The structure which seperates the middle ear from the ear canal is called the:

a. mastoid process
b. pars tensa
c. tympanic membrane
d. pars flaccida

Please indicate the correct location of each of the following structures by marking an A for the external ear and B for the middle ear.

22. Tragus
23. Helix
24. Incus

25. Which of the following sinus(s) are accessible to clinical examination:

1. sphenoid
2. ethmoid
3. frontal
4. maxillary

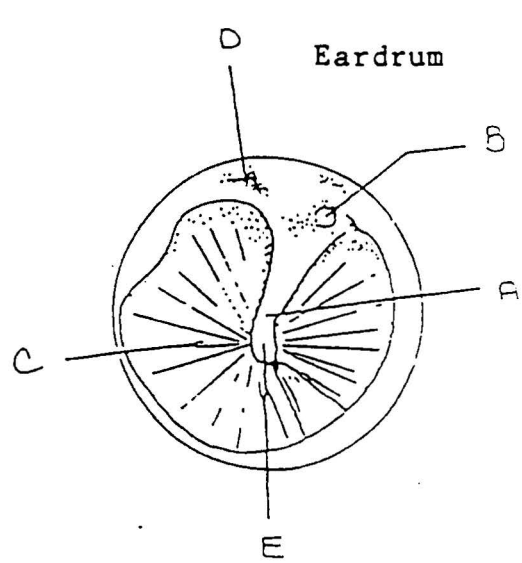
a. 3 only
b. 1 & 3
c. 3 & 4
d. 1 & 3
e. 2 only

26. Which of the following characteristics should be noted when the external nose is examined:

a. symmetry
b. deformity
c. patency
d. all of the above
e. a and b

Identify the following on the diagram below:

27. Pars Tensa
28. Umbo
29. Handle of the Malleus
30. Short process of the Malleus
31. Pars Flaccida



Appendix C

Test B

Please do not write on this test. Use the opscan sheet to record your answers. Do not write your name, only your social security number on the opscan sheet. Please read each question carefully and select the best answer.

1. When testing visual acuity using the Snellan eye chart and recording results, the numerator indicates:

a. the distance of the patiient from the eye chart
b. the distance at which a person with normal vision can read the letters
c. the distance the patient can see with reading glasses
d. the distance the patient can see without reading glasses

2. The upper eyelids should not overlap the iris:

a. True
b. False

3. When you press on the nasolacrimal sac, the material causing the duct blockage will emerge through the:

a. sclera
b. nasolacarimal duct
c. puncta
d. nose

4. When examining the eyelids, one should note the position of the eyelids in relationship to the eyeballs and inspect for:

a. edema
b. color
c. lesions
d. all of the above
e. a & c

5. To assess extraocular movements of the eye the following procedure should be followed:

a. slowly bring a pencil or other small test object from the periphery into the field of vision from 8 different directions, and ask the patient to say "now" as soon as it appears in his/her visual field
b. ask the patient to observe the tip of a pencil or finder as it is moved toward the bridge of their nose
c. ask the patient to follow your pencil or finger as you move it through the six cardinal directions of gaze
d. ask the patient to count the number of fingers you are holding up

6. When testing for accommodation, the examiner should:

a. slowly bring a pencil from the periphery into the field of vision from 8 different directions, and ask the patient to say, "now" as soon as it appears in his/her field.
b. ask the patient to follow a pencil or finger as it is moved in toward the bridge of their nose
c. ask the patient to follow the a pencil or finger as it is moved through the six cardinal directions of gaze
d. ask the patient to count the number of fingers that are held up

7. A cover/uncover test is performed to assess:

a. visual fields
b. the position and alignment of the eyes
c. the extraocular muscles of the eye
d. the ability of the eyes to converge

8. When performing an opthalmoscopic examination the eyes should be examined from a position of about:

a. 20 inches away from the patient and 20 degrees lateral to the patient's line of vision
b. 15 inches away from the patient and 15 degrees lateral to the patients's line of vision
c. 15 inches away from the patient and 5 degrees lateral to the patient's line of vision
d. 5 inches away from the patient and 15 degrees lateral to the patient's line of vision

9. Which of the following may result in absence of a red reflex:

a. opacity of the lens such as cataracts
b. opacity of the vitreous body
c. a and b
d. neither a nor b

10. Which of the following structures can be examined using the opthalmoscope?

1. optic disc and cup
2. optic Chiasm
3. retinal arteries and veins
4. optic tract
5. macula

a. 1 & 2
b. 1 & 3
c. 1 & 3 & 5
d. 2 & 4

11. When performing an opthalmoscopic examination you should use your left hand and left eye to examine the patient's left eye.

a. True
b. False

12. When assessing the pupillary reaction to light, the examiner should assess:

a. pupillary construction in the same eye
b. pupillary constriction in the opposite eye
c. fine rhythmic oscillation of the eyes
d. a & b
e. all of the above

13. When comparing arteries to veins during the opthalmoscopic examination, which statement is FALSE:

1. Arteries are darker in color
2. Arteries are lighter in color
3. Arteries are larger than veins
4. Arteries are smaller than veins

a. 1 & 3
b. 1 & 4
c. 2 & 3
d. 2 & 4

14. The tiny bright reflection in the center of the macula is called the:

a. optic disc
b. physiologic cup
c. fovea centralis
d. retina

15. When performing an opthalmoscopic examination, the red reflex may be seen as:

a. orange glow in the pupil
b. yellowish orange to creamy pink, oval or round structure
c. a bright red spot

Appendix D

Test C

Directions:

Please do not write on this test. Use the opscan sheet to record your answers. Do not write your name, only your social security number on the opscan sheet. Please read each question carefully and select the best answer.

1. When examining the ear, the auricle should be grasped firmly but gently and pulled upward, back and slightly out.

a. True
b. False

2. When examining the ear canal, the largest ear speculum that the canal will accommodate should be used:

a. True
b. False

3. During inspection and palpation of the external ear and mastoid process the following should be assessed:

a. symmetry, placement, deformity
b. masses, nodules, lesions edema
c. color
d. a & b
e. a, b, c

4. A normal response to the Weber test would be:

a. bone conduction is greater than air conduction
b. sound is heard in the midline or equally in both ears
c. air conduction is greater than bone conduction
d. bone conduction is the same as air conduction

5. A normal response to the Rinne Test would be:

a. bone conduction is greater than air conduction
b. bone conduction is the same as air conduction
c. air conduction is greater than bone conduction
d. sound is heard in the midline or equally in both ears

6. The color of the tympanic membrane is normally:

a. pearly gray
b. white
c. light pink
d. red

7. Please indicate the correct location of each of the following structures by marking A for the outer ear, B for the middle ear, or C for the inner ear.

7. Incus
8. Ear Canal
9. Mastoid process

10. Which of the following sinuses are normally accessible to clinical examination:

a. sphenoid and ethmoid
b. frontal and ethmoid
c. frontal and maxillary
d. sphenoid and ethmoid

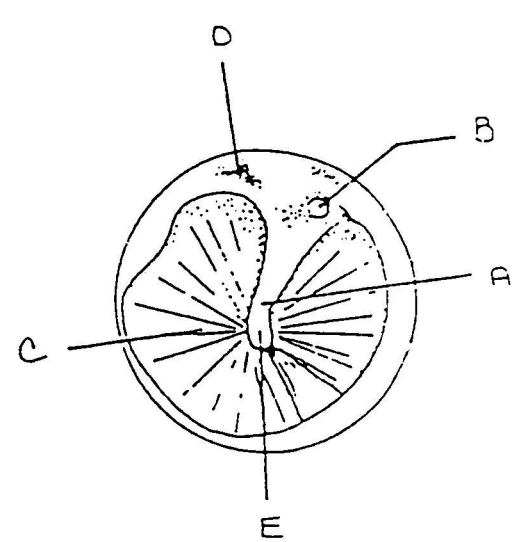
11. All of the following characteristics should be noted when the external nose is examined EXCEPT:

a. deformity
b. patency
c. color
d. a & b
e. all of the above

12. Identify the following on the diagram below:

12. Pars Tensa
13. Umbo
14. Handle of the Malleus
15. Short process of the Malleus
16. Pars Flaccida

EARDRUM



Appendix E

TEST D

EYES

	Possible Points	Examines	Reports	Omitted	Points Earned
1. Inspects:					
a. Eyebrows	1				
b. Eyelids and lashes	1				
c. Conjuctivae	1				
d. Sclera	1				
e. Cornea	1				
f. Iris and pupils	1				
g. Lens	1				
2. Palpates:					
a. Lacrimal apparatus	1				
b. Puncta, lacrimal sac	1				
c. Periorbital area	1				
3. Tests:					
a. Visual acuity	1				
b. Visual fields	1				
c. Extra-ocular movements	1				
d. Corneal light reflex	1				
e. Cover-uncover test	1				
f. Pupils-light reaction	1				
g. Accomodation	1				
4. Elicits red reflex, using opthalmoscope	1				

Appendix F

TEST E

	Possible Points	Examines	Reports	Omitted	Points Earned
EAR					
1. Assesses auditory acuity					
a. Gross	1				
b. Weber	1				
c. Rinne	1				
2. Inspects auricle for:					
a. Placement	1				
b. Masses	1				
c. Lesions	1				
d. Inflamation	1				
3. Palpates auricle for:					
a. Masses	1				
b. Tenderness	1				
4. Otoscopy					
a. Examines external canal	1				
b. Visualizes tympanic membrane and landmarks	1				
c. Describes light reflex	1				
NOSE AND PARANASAL SINUSUS					
1. Palpates:					
a. Frontal sinuses	1				
b. Maxillary sinuses	1				
2. Tests nose for patency	1				
3. Inspects nasal cavity:					
a. Mucosa	1				
b. Septum	1				
c. Inferior and middle turbinates	1				

Appendix G

DEMOGRAPHIC INFORMATION

Social Security # _____

Demographic Information

1. Age 1. _____

2. Educational Background 2. _____

   a. Diploma, School of Nursing
   b. Associated Degree of Nursing Program

3. How many years have you spent working as a Registered Nurse? 3. _____

4. How many hours per week do you work? 4. _____

For the questions 5 thru 7 answer A if the answer is yes and B if the answer is no.

5. Do you own a personal computer? 5. _____

6. Do you utilize a computer at work? 6. _____

7. Have you ever utilized computer assisted instruction before? 7. _____

	Agree				Disagree
8. I spent less time studying after reviewing the CAI than after reviewing the videotape.	1	2	3	4	5
9. The videotape instruction was more interesting than the computer assisted instruction.	1	2	3	4	5
10. The reinforcement exercises in the computer assisted program were very helpful.	1	2	3	4	5

Please briefly explain the method you preferred and why on the back of this page. Thank you!

Appendix H

LETTER TO CHAIRPERSON

Chairperson, School of Nursing
Old Dominion University
Norfolk, Virginia 23508

Dear Dr. Davis:

As a graduate nursing student at Old Dominion University, I am interested in comparing the effects of computer-assisted instruction (CAI) versus videotape instruction on cognitive, transfer and retention learning consequences of registered nurses pursuing a bachelor's degree in nursing. With your permission, I would like to ask the registered nurses in Nursing 261 to participate in this study.

The content covered in both teaching methods is part of the required content for Nursing 261. The computer-assisted instruction is correlated with A Visual Guide to Physical Examination, J.P. Lippincott, a series of videotapes which are presently being used in this course.

Each participant will be asked to take a pretest and then will be randomly assigned to a group. Group 1 will use the CAI for the examination of the eye and the videotape instruction for the examination of the ear and nose. Participants in group 2 will use the CAI for the examination of the ear and nose and the videotape instruction for the examination of the eye. Following each form of instruction, students will be asked to complete a posttest. Participants in both groups will be asked to demonstrate the examination of the eye, ear and nost after practicing in the lab. Five weeks following instruction students will be asked to complete a retention test and a questionaire requesting demographic data and preference regarding teaching strategies.

I will explain to the students that participation is voluntary, and they can drop out of the study at any time. If they do agree to participate their test scores will remain confidential. Their instructor in Nursing 261 will not be made aware of these scores, and their scores will not effect their course grade in any way. All potential participants will also receive a letter explaining to them what will be required if they agree to participate and how to contact me if they have any problems or questions.

I would appreciate meeting with you to further explain the study and to answer any questions you might have. The proposed dates to collect data would be May 1988 through June 1988.

Thank you for your assistance.

Sincerely,

Linda McCormack-Miller