DOCUMENT RESUME

ED 129 282 IR 004 065

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TITLE A Comparison Between Achievement Gains in Multimedia Instruction and Conventional Lecture Method of Instruction of Nursing Courses at Northern Virginia Community College.
INSTITUTION Northern Virginia Community Coll., Annandale.
PUB DATE Dec 74
NOTE 42p.

EDRS PRICE MF-$0.83 HC-$2.06 Plus Postage.
DESCRIPTORS Academic Achievement; Community Colleges; Comparative Analysis; Conventional Instruction; Lecture; *Media Research; Medical Education; *Multimedia Instruction; *Nursing; Program Effectiveness; *Program Evaluation
IDENTIFIERS Northern Virginia Community College

ABSTRACT

An evaluation was conducted at Northern Virginia Community College to assess the effectiveness of courses in nursing education presented in two distinctly different styles: the traditional lecture method; and a multimedia approach employing textbooks, audiovisual aids, study guides, and lectures. Using State Board of Nursing Examination Scores as a measure of instructional outcomes, comparisons were made which demonstrated that students were equally likely to master nursing skills regardless of the mode of instruction. This report provides background information on the study, outlines the research methodology, reviews relevant literature, analyzes data, and summarizes results. (EMH)

A COMPARISON BETWEEN ACHIEVEMENT GAINS IN MULTIMEDIA INSTRUCTION AND CONVENTIONAL LECTURE METHOD OF INSTRUCTION OF NURSING COURSES AT NORTHERN VIRGINIA COMMUNITY COLLEGE

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DECEMBER, 1974

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CHAPTER I

THE PROBLEM

Introduction

The aim of this study is to evaluate the effectiveness of the presentation of Nursing courses to the students at Northern Virginia Community College. Since two distinct methods of presentation have been used in the past several years, it seemed important that the effectiveness of these two presentations be evaluated. One method of presentation is the conventional lecture method. The other method of presentation utilizes multimedia instruction which includes textbooks, films, filmstrips, discussion groups, study guides, lecture sessions, and oral and written quiz sessions.

This study analyzes the State Board of Nursing Examination test scores of the class of 1974 who received their nursing education using multimedia instruction; versus the prior three classes (1971, 1972, 1973) of nursing students who received their nursing education through conventional lecture method.

The Hypothesis

The study hypothesized that there would be no significant difference in level of achievement between students taught nursing concepts by means of conventional lecture method and students taught nursing concepts by multimedia instruction. For analysis purposes, this hypothesis was subdivided into the five categories corresponding to the five areas of study incorporated in the nursing curriculum: Medical Nursing, Surgical Nursing, Obstetric Nursing, Pediatric Nursing, and Psychiatric Nursing.

Definition of Terms

Conventional lecture method. Conventional lecture method of instruction is the logical and sequential presentation of nursing concepts through a teacher's efforts to assist students in attaining sufficient self-motivation in order to achieve the goals of the course. The conventional lecture method of instruction in Nursing courses at Northern Virginia Community College was utilized in 1971, 1972, and 1973.

Multimedia instruction. Multimedia instruction is a logical sequence of operations performed primarily by student self-direction and self-motivation in order to achieve the goals of the course. Instructor-prepared, weekly study guide directs the student through that week's foci. Filmstrips are a strip of film bearing a sequence of frames of still pictures to be projected onto a screen with explanatory narration to be utilized as a teaching aid. In this study filmstrips were viewed independently by students. Discussion groups were a weekly, one hour, gathering of 15 students and one instructor, for the purpose of arriving at truth or clearing up difficulties about the week's foci. Quiz sessions were held weekly, consisting of approximately twenty-five (25) written test items, and ten (10) oral discussion items.

Medical nursing. Medical nursing is the scientific care of the sick pertaining to medical diseases.

Surgical nursing. Surgical nursing is the scientific care of the sick who have undergone operative procedures.

Obstetrical nursing. Obstetrical nursing is the scientific management of women during pregnancy, childbirth, and the puerperium, and the care of the newborn.

Pediatric nursing. Pediatric nursing is the scientific treatment and care of children.

Psychiatric nursing. Psychiatric nursing is the scientific care of the sick dealing with mental ailments.

CHAPTER II

THE METHODOLOGY

The method used in this study was the experimental method. The subjects involved in the experiment were graduate nurses from the Annandale Campus of Northern Virginia Community College. They were in the graduate classes of 1971, 1972, 1973, and 1974. The graduates of 1971, 1972, and 1973 were taught nursing courses under conventional lecture methods. The graduates of 1974 were taught nursing courses using multimedia instruction. To provide further clarification regarding the subjects included in this experiment, Table I shows the number of students in the control group (conventional presentation) and the number of students in the experimental group (multimedia instruction). Further information is provided in Table I concerning the mean age for each group, along with totals for sex.

Another factor considered important in the study was the number of students who failed any one of the five subject area examinations on the State Board Examination, thus not qualifying for registration as an R. N. The number of failures for each group studied and the total number of failures is provided in Table I.

The instrument upon which the experimental comparison was based was the State Board of Nursing licensing examination. These tests were considered a valid measure of achievement because of their standardization. This test, administered to graduate nurses throughout the United States, is produced by the National League for Nursing test pool. It is looked upon as the minimum acceptance standard for practicing nursing throughout the nation. Each student takes five tests: Medical Nursing, Surgical Nursing, Obstetrical Nursing, Pediatric Nursing, and Psychiatric

TABLE I

CHARACTERISTICS OF GROUPS

Students	Experimental Group	Control Group	Totals
Male	5	4	9
Female	124	123	247
Totals	129	127	256
Mean Age	27.124	26.666	-
Failures	9	15	24

Nursing. A minimum score of 350 on each test is considered passing, and all five tests must be passed, in order for a graduate student to qualify for registration.

A student who fails any test may repeat that examination at a later date, but this study deals only with the socres of the first examination taken by each graduate nurse.

To provide further clarification regarding the test scores included in this experiment, Table II shows the mean score of each of the five test scores in the control group and in the experimental group. Further information is provided in Table II concerning the difference in test scores between the two groups. A complete listing of scores on each of the five tests for the control group are shown (see Appendix A) as are the five test scores for the experimental group (see Appendix B).

To assist in performing the statistical analysis, and to provide data summaries, permission was granted by Northern Virginia Community College to utilize their computer facilities at the Annandale Campus. The computer used in analyzing the data and performing the statistical tests was the IBM 370-145 computer. The statistical package for the Social Science Procedure was utilized.

An experimental design was used to analyze the implementations of the multimedia and conventional methods of presenting Nursing courses. To perform this comparison an analysis of the equality of the means utilizing the t-test was employed. An explanation for the formula can be seen in Table III.

TABLE II

MEAN SCORES ON STATE BOARD EXAMINATION

Test	A Experimental Group	B Control Group	Difference A-B
Medical Nursing	557.170	541.653	15.517
Surgical Nursing	546.527	534.417	12.110
Obstetrical Nursing	536.077	523.622	12.455
Pediatric Nursing	546.101	533.212	12.889
Psychiatric Nursing	568.232	525.449	32.783

TABLE III

THE t - TEST FOR INDEPENDENT SAMPLES

Compute $t = \dfrac{\bar{x}_1 - \bar{x}_2}{S\ \bar{x}_1 - \bar{x}_2}$ $\quad \bar{x}_1 - \bar{x}_2$ = the observed difference between two means

where $\bar{x}_1 = \dfrac{\sum_{i=1}^{n_1} \bar{x}_1 i}{n_1}$, $\bar{x}_2 = \dfrac{\sum_{j=1}^{n_2} \bar{x}_2 j}{n_2}$

$\bar{x}_1$ = mean of the items in the first group
$\bar{x}_2$ = mean of the items in the second group

and $S^2\ \bar{x}_1 - \bar{x}_2 = \dfrac{S^2}{n_1} + \dfrac{S^2}{n_2} = S^2 \left(\dfrac{1}{n_1} + \dfrac{1}{n_2}\right)$

S^2 is a pooled estimate of the common variance σ^2 and is found by computing:

$$S^2 = \frac{\sum_{i=1}^{n_1} X_1{}^2 i + \sum_{j=1}^{n_2} X_2{}^2 j}{n_1 + n_2 - 2}$$

where $n_1\ S_1{}^2 = \sum_{i=1}^{n_1} X_1{}^2 i$, $n_2\ S_2{}^2 = \sum_{j=1}^{n_2} X_2{}^2 j$

then $S^2 = \dfrac{n_1\ S_1{}^2 + n_2\ S_2{}^2}{n_1 + n_2 - 2}$

then $S^2\ \bar{x}_1 - \bar{x}_2 = S^2 \left(\dfrac{1}{n_1} + \dfrac{1}{n_2}\right)$

and $S^2\ \bar{x}_1 - \bar{x}_2 = \dfrac{n_1\ S_1{}^2 + n_2\ S_2{}^2}{n_1 + n_2 - 2} \left(\dfrac{1}{n_1} + \dfrac{1}{n_2}\right)$

or $S\ \bar{x}_1 - \bar{x}_2 = \sqrt{\dfrac{n_1\ S_1{}^2 + n_2\ S_2{}^2}{n_1 + n_2 - 2} \left(\dfrac{1}{n_1} + \dfrac{1}{n_2}\right)}$

Therfore:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\dfrac{n_1\ S_1{}^2 + n_2\ S_2{}^2}{n_1 + n_2 - 2} \cdot \left(\dfrac{1}{n_1} + \dfrac{1}{n_2}\right)}}$$

CHAPTER III

THE REVIEW OF THE LITERATURE

Introduction

A survey of the literature revealed very few studies based upon experimental comparisons of multimedia instruction versus conventional instruction at the college level. There were even fewer studies regarding Nursing courses.

Recent Studies Related to This Study

Although independent instruction promises greater effectiveness, research regarding this method has been meager. An audiovisual system permits a student to see or hear even small details, reduces repetitive demonstrations, allows for more sophisticated demonstrations, and increases a student's ability to relate theory to clinical practice (Stein, et. al., 1972).

In another program, a comparative study of matched groups resulted in no significant difference in performance by the tape-taught section (Popham, 1961). Stewart (1965) examined student achievement in both traditional and independent study groups and found no significant differences. Mager (1961) found that motivations and satisfactions increased as a function of the amount of control which students have over their own learning.

Postlethwait, et. al., (1964) who had extensive experience with multimedia approaches at Purdue University, stated that audiotutorial system of teaching improves learning and allows for more course content.

Bitzer and Boudreaux (1969) described a computer course for teaching maternity nursing. Student reaction to the computer course varied considerably, however, one-half of the students rated this form of learning as the preferred medium for learning.

White (1970) described the effectiveness of an individual study approach to associate degree nursing students, and found their test scores did not result in higher achievement levels, although the scores were as good as from the traditional approach.

Vonder Meer (1970) investigated the extent to which instructional films by themselves can teach a body of factual information. Test results showed there was no significant difference where the learning of factual information was the sole criterion.

Stein, et. al., (1972) found that the number of faculty members per student could not be reduced with independent multimedia instruction. They believed that the audio-visual materials were not sufficient replacements for teachers. This was again found to be true by Mentzer (1970).

Mentzer stated the multimedia approach is not satisfactory if it is provided to large numbers of students; a small student-instructor ratio is the greatest asset to this type of program. Students require personal contact along with audio-visual materials to derive maximum benefit from the learning process.

At Northern Virginia Community College, Conroy (1971) found as the age of a student increases, his ability to achieve success in remedial Algebra I using either programmed instruction or conventional instruction also increases. Overall though, there was no significant difference in achievement when using either method of presentation.

Summary

In summary, there seems to be a lack of studies that make significant contributions in the area of comparative analysis of multimedia instruction versus conventional instruction in Nursing courses. Through a review of the related literature,

it was found that the present study was not a replication of any existent study since the variables that were involved and the very limited number of studies comparing multimedia instruction versus conventional instruction in Nursing courses tended to make this study unique.

CHAPTER IV

THE ANALYSIS OF THE DATA

Presentation of the Data

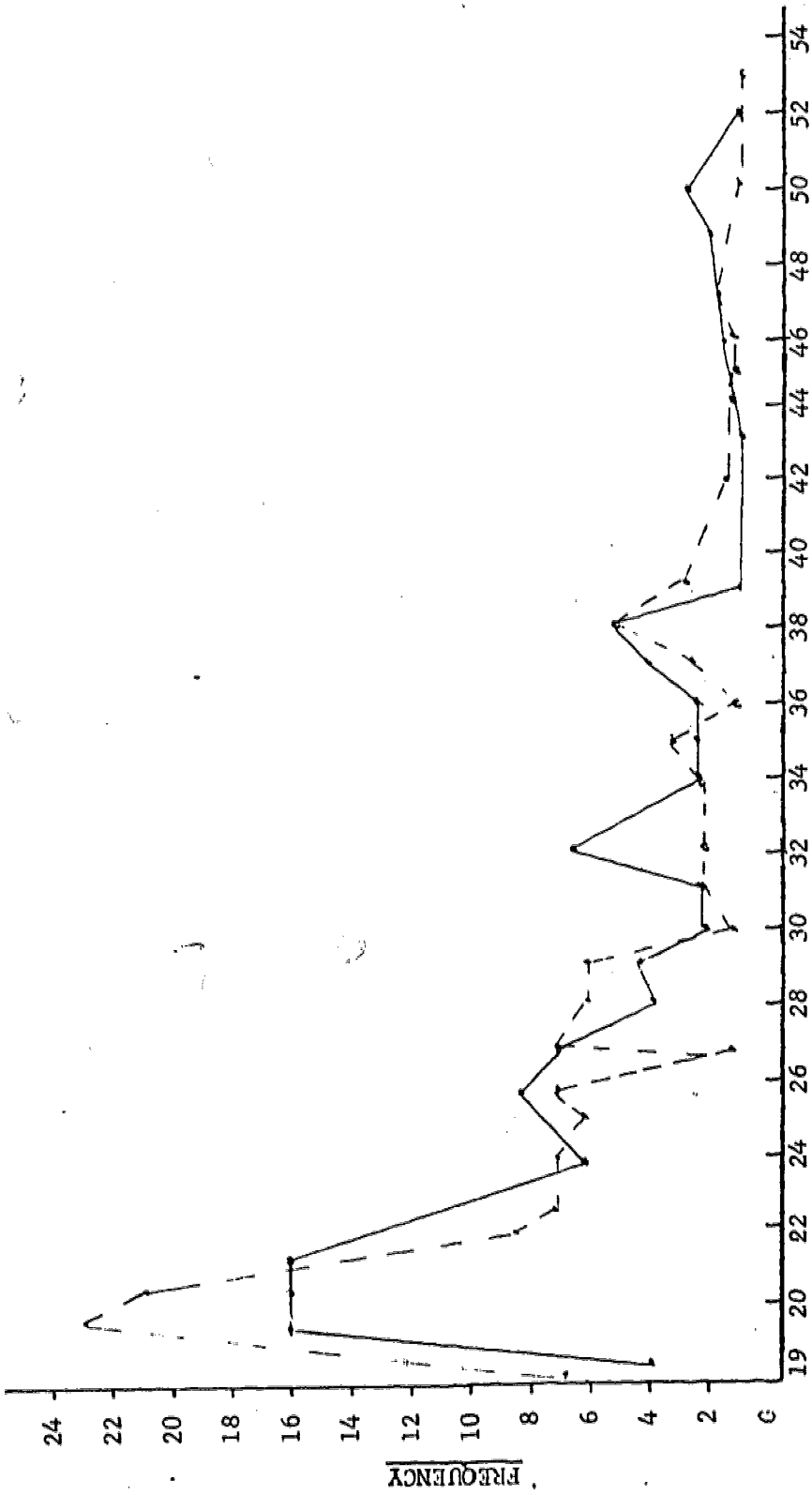
The problem of this study was to evaluate the effectiveness upon achievement gain when using the two methods of instruction: multimedia and conventional lecture method, in presenting Nursing courses to the students at Northern Virginia Community College.

Five test scores were recorded for each student: Medical Nursing, Surgical Nursing, Obstetrical Nursing, Pediatric Nursing, and Psychiatric Nursing. The mean score for the experimental group (graduating class of 1974) will be compared with the mean score for the control group (graduating classes of 1971, 1972, and 1973) in each of the five test areas. The hypothesis, "that there will be no significant difference in achievement between the students in multimedia instruction and those students in conventional lecture method of instruction on each of the five test scores," will be tested.

Each part of the hypothesis was considered and the test or tests associated with the statistical evaluation of the hypothesis was presented. As stated in Chapter II, concerning the methodology, the t-test for testing the equality of means was used throughout all the evaluation of the hypotheses.

To provide further clarification concerning the relationship of the distributions of the ages for both conventional instruction and multimedia instruction, a graphical representation is included as Figure 1, page 13. A brief analysis of both distributions should reveal the relative similarity of age distribution in respect to the students under multimedia instruction and the students under conventional instruction.

FIGURE I



Distribution of ages for student in Multimedia Instruction and Conventional Instruction

Interpretation of the Findings

The first problem. The first problem was to associate the mean score of the experimental group versus the mean score of the control group in the Medical Nursing test. The t-test of significance was applied to evaluate the effect. A complete listing of statistical data on the Nursing test scores can be found in Appendix C.

In performing the t-test, the number of students from the experimental group (n_1) was 129 and the number of students from the control group (n_2) was 127. The degrees of freedom were 254. The level of significant difference in achievement gain in Medical Nursing was at the five (5) percent level ($\alpha = .05$). The calculated value for the t statistic obtained was 1.299. In referencing the t table with the degree of freedom being 254 (df = 254), the value beyond which the null hypothesis would be rejected at the five (5) percent level of significance ($\alpha = .05$) was 1.970 (reject if $t > t_{.05(25^{\wedge})} = 1.970$. Since the calculated value of t obtained for this test did not exceed the value of t from the t table ($t = 1.299 < 1.970$), the null hypothesis that there would be no significant effect upon learning using multimedia instruction was accepted. The calculations used in computing the t-value for the means of the scores in this test can be found in Appendix C along with the data base for Medical Nursing scores.

The second problem. The second problem, to evaluate Surgical Nursing test scores, was performed in similar manner to the Medical Nursing test scores. The calculated value for the Surgical Nursing t statistic obtained was 1.046. The null hypothesis would be rejected if $t > t_{.05(254)} = 1.970$. Since $t = 1.046 < 1.970$ the null hypothesis that there was no significant effect upon learning using multimedia instruction was accepted.

The third problem. The third problem, to evaluate Obstetric Nursing test scores, was performed in similar manner to the previous two. The calculated value for Obstetric Nursing t statistic obtained was 1.034. The null hypothesis would be rejected if $t > t_{.05(254)} = 1.970$. Since $t = 1.034 < 1.970$ the null hypothesis that there was no significant effect upon learning using multimedia instruction was accepted.

The fourth problem. The fourth problem, to evaluate Pediatric Nursing test scores, was performed in similar manner to the previous three. The calculated value for Pediatric Nursing t statistic obtained was 1.104. The null hypothesis would be rejected if $t > t_{.05(254)} = 1.970$. Since $t = 1.104 < 1.970$ the null hypothesis that there was no significant effect upon learning using multimedia instruction was accepted.

The fifth problem. The fifth problem, to evaluate Psychiatric Nursing test scores, was performed in similar manner to the previous four. The calculated value for Psychiatric Nursing t statistic obtained was 3.760. The null hypothesis would be rejected if $t > t_{.05(254)} = 1.970$. Since $t = 3.760 > 1.970$, the null hypothesis that there was no significant effect upon learning using multimedia instruction was rejected in favor of the alternative hypothesis, that multimedia instruction is a significant factor to be considered when presenting Psychiatric Nursing content to nursing students at Northern Virginia Community College.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to make a comparative analysis and interpretation of the students' achievement gains in Nursing courses when using multimedia instruction versus conventional lecture method of instruction at Northern Virginia Community College during the years 1971 through 1974.

The experimental design. The experimental design was used in the statistical analyses of the hypotheses of this study. The t - statistic was employed to test for the significance of the difference of the means of the test scores. The State Board of Nursing test scores were used in Medical Nursing, Surgical Nursing, Obstetric Nursing, Pediatric Nursing and Psychiatric Nursing.

Major findings. The major findings of this study that are relevant to Nursing students at Northern Virginia Community College are listed below.

The Hypothesis

This study hypothesized that there would be no significant difference in level of achievement between students taught nursing concepts by means of conventional lecture method and students taught nursing concepts by multimedia instruction. For analysis purposes this was subdivided:

Medical Nursing. This study hypothesized that there would be no significant difference in level of achievement in Medical Nursing. This hypothesis was analyzed by comparing the test scores of multimedia instruction and conventional instruction. The test indicated the acceptance at the .05 level of probability, of this null

hypothesis that multimedia instruction was not a significant factor that could affect the achievement of Medical Nursing test scores.

Surgical Nursing. This study hypothesized that there would be no significant difference in level of achievement in Surgical Nursing. This hypothesis was analyzed by comparing the test scores of multimedia instruction and conventional instruction. The test indicated the acceptance at the .05 level of probability, of this null hypothesis that multimedia instruction was not a significant factor that could affect the achievement of Surgical Nursing test scores.

Obstetric Nursing. This study hypothesized that there would be no significant difference in level of achievement in Obstetric Nursing. This hypothesis was analyzed by comparing the test scores of multimedia instruction and conventional instruction. The test indicated the acceptance at the .05 level of probability, of this null hypothesis that multimedia instruction was not a significant factor that could affect the achievement of Obstetric Nursing test scores.

Pediatric Nursing. This study hypothesized that there would be no significant difference in level of achievement in Pediatric Nursing. This hypothesis was analyzed by comparing the test socres of multimedia instruction and conventional instruction. The test indicated the acceptance at the .05 level of probability, of this null hypothesis that multimedia instruction was not a significant factor that could affect the achievement of Pediatric Nursing test scores.

Psychiatric Nursing. This study hypothesized that there would be no significant difference in level of achievement in Psychiatric Nursing. This hypothesis was analyzed by comparing the test scores of multimedia instruction and conventional instruction. This hypothesis was rejected at the .05 level of probability, in favor

of the alternative hypothesis that multimedia instruction did cause a significant difference in achievement in Psychiatric Nursing test scores.

Conclusions

1. Any student in the Nursing Program at Northern Virginia Community College can achieve the objectives of these courses equally well by taking the courses under multimedia instruction or conventional lecture method.

2. The fact that there was a significant improvement in test scores in Psychiatric Nursing using multimedia instruction was very important. A possible rationale for the occurrence of this phenomena could be explained by the addition of another, previously not mentioned variable. In the control group (graduating classes of 1971, 1972, and 1973) Psychiatric Nursing didactic content was taught during a short summer quarter. In the experimental group (graduating class of 1974) Psychiatric Nursing didactic content was integrated throughout the seven quarters of the Nursing course.

Recommendations

Several suggestions in light of the statistical results and conclusions of this study are recommended as possible topics for further investigation and evaluation.

1. Another comparison between achievement gains in multimedia instruction and conventional lecture method of instruction of Nursing courses should be accomplished because this study included 129 students out of a total 1974 graduating class of 142 State Board of Nursing test scores, for the remaining 13 students were not available when this study was begun in October 1974. It is possible that with the remaining students added, there may be some significant difference between the two methods of instruction.

2. Regular evaluations of the Nursing Program using the statistical model of this study should be performed at Northern Virginia Community College and the results of each evaluation should be compiled and analyzed. These regular evaluations of the methods of presenting Nursing courses are necessary in order to increase the reliability of the indicated conclusions of this study.

3. The investigator recommends that an in-depth analysis of the factor of age be performed on the test scores of this model to further analyze the effect of multimedia instruction versus conventional lecture method of instruction on the Nursing students at Northern Virginia Community College.

4. More studies similar to this study, which would evaluate the effects of multimedia instruction versus conventional instruction, should be performed at community colleges throughout the country, to analyze and compare their results to the results of this study.

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APPENDIX A

DATA BASE FOR CONTROL GROUP

TABLE IV

COMPLETE DATA TABLE FOR CONVENTIONAL LECTURE METHOD

(GRADUATING CLASS OF 1971)

Student Code	Sex	Age	Medical Nursing	Surgical Nursing	Obstetrical Nursing	Pediatric Nursing	Psychiatric Nursing	Pass/ Fail
1	F	23	542	595	481	614	486	P
2	F	20	516	407	509	471	566	P
3	F	47	602	609	632	614	542	P
4	F	44	542	465	509	546	486	P
5	F	38	555	638	669	584	542	P
6	F	28	648	667	726	720	670	P
7	F	25	595	660	622	486	430	P
8	F	37	608	624	585	683	558	P
9	M	21	555	566	500	539	550	P
10	F	20	469	465	462	539	558	P
11	F	26	595	537	340	531	494	F
12	F	32	582	602	509	592	622	P
13	F	20	336	429	350	312	422	F
14	F	21	389	378	406	425	462	P
15	F	39	735	739	763	766	767	P
16	F	54	622	573	594	660	622	P
17	F	20	529	523	547	501	422	P
18	F	20	389	451	444	455	462	P
19	M	34	383	407	406	357	550	P
20	F	36	628	544	547	561	574	P
21	F	29	476	386	425	455	574	P
22	F	19	469	494	509	554	430	P
23	F	52	608	689	688	683	670	P
24	F	26	575	624	519	501	614	P
25	F	21	489	508	397	592	462	P
26	F	21	509	552	575	554	494	P
27	F	29	608	609	575	561	622	P
28	F	48	688	674	650	630	590	P
29	F	28	542	552	613	584	414	P
30	F	20	542	508	528	516	510	P
256	F	20	622	573	632	614	670	P

TABLE IV

(Continued)

CONCEPTUAL DATA BASE FOR CONVENTIONAL LECTURE METHOD

(GRADUATING CLASS OF 1972)

Student Code	Sex	Age	Medical Nursing	Surgical Nursing	Obstetrical Nursing	Pediatric Nursing	Psychiatric Nursing	Final Grade
31	F	50	697	718	635	595	602	P
32	F	37	663	598	635	602	602	P
33	F	39	496	520	537	518	549	P
34	F	21	603	470	457	469	572	P
35	F	35	630	640	688	588	595	P
36	F	22	523	626	465	427	510	P
37	F	38	410	342	474	455	426	P
38	F	24	229	264	242	286	388	F
39	F	48	757	718	653	700	748	P
40	F	33	650	612	564	588	572	P
41	F	23	450	505	501	385	395	P
42	F	35	630	633	617	679	664	P
43	F	19	557	534	492	637	411	P
44	F	38	690	718	706	672	633	P
45	F	26	490	427	367	385	449	P
46	F	42	610	576	581	553	579	P
47	F	20	657	569	573	736	671	P
48	F	23	390	342	465	385	418	F
49	F	21	577	576	680	637	510	P
50	F	21	470	413	537	350	457	P
51	F	21	550	598	537	602	633	P
52	F	21	590	541	537	539	533	P
53	F	25	543	569	537	518	603	P
54	F	21	430	470	510	462	426	P
55	F	29	677	669	688	658	694	P
56	F	20	363	364	421	328	449	F
57	F	39	630	520	635	574	579	P

TABLE IV (Class of 1972) Continued

Student Code	Sex	Age	Medical Nursing	Surgical Nursing	Obstetrical Nursing	Pediatric Nursing	Psychiatric Nursing	Pass / Fail
58	F	23	470	534	465	518	388	P
59	F	26	523	541	501	567	449	P
60	F	29	623	654	662	595	457	P
61	F	27	490	406	457	399	480	P
62	F	25	496	619	608	511	503	P
63	F	22	597	562	537	532	579	P
64	F	21	410	619	608	483	564	P
65	F	28	730	739	680	693	664	P
66	F	21	537	513	510	469	503	P
67	F	24	637	598	573	679	541	P
70	F	35	623	569	635	715	633	P
71	F	24	663	647	644	637	625	P
72	F	37	550	442	474	504	549	P
73	F	25	630	576	528	630	572	P
74	F	21	470	392	394	413	541	P
75	F	25	356	314	421	371	434	F
76	F	20	476	463	537	581	510	P
77	F	20	543	477	403	434	395	P
78	F	19	523	484	501	462	441	P
79	F	20	603	484	421	455	510	P
80	F	30	623	562	537	546	572	P
81	F	21	603	520	564	581	472	P
82	F	20	724	583	599	469	687	P

TABLE IV

(Continued)

COMPLETE DATA BASE FOR CONVENTIONAL LECTURE METHOD

(GRADUATING CLASS OF 1973)

Student Code	Sex	Age	Medical Nursing	Surgical Nursing	Obstetrical Nursing	Pediatric Nursing	Psychiatric Nursing	Pass/ Fail
81	F	21	426	396	341	400	373	F
82	F	22	667	596	658	538	477	P
83	F	21	681	716	641	705	659	P
84	F	29	564	616	524	546	508	P
85	F	19	515	523	541	502	477	P
86	F	21	426	516	391	466	405	P
87	F	21	405	450	358	480	508	P
88	F	33	522	503	508	567	500	P
89	F	31	633	590	558	662	635	P
90	F	20	439	329	366	415	445	F
91	F	21	536	570	524	531	540	P
92	F	26	619	556	516	546	564	P
93	F	22	429	450	391	328	326	F
94	F	22	481	483	449	466	389	P
95	F	19	453	383	358	444	389	P
96	M	24	543	436	325	458	413	F
97	M	24	543	516	483	487	461	P
98	F	19	453	450	458	473	469	P
99	F	23	571	536	558	553	500	P
100	F	20	550	476	474	502	373	P
101	F	32	481	403	474	531	508	P
102	F	20	564	590	566	575	477	P
103	F	19	508	503	524	546	564	P
104	F	26	495	596	591	560	564	P
105	F	21	550	596	516	437	500	P
106	F	23	543	596	491	618	508	P

TABLE IV (Class of 1973) Continued

Student Code	Sex	Age	Medical Nursing	Surgical Nursing	Obstetrical Nursing	Pediatric Nursing	Psychiatric Nursing	Pass/ Fail
107	F	28	519	616	608	596	572	P
108	F	20	405	319	300	487	357	F
109	F	20	398	396	441	422	342	F
110	F	21	363	456	408	502	365	P
111	F	22	550	503	558	509	564	P
112	F	23	467	563	474	451	508	P
113	F	28	674	623	641	625	508	P
114	F	20	550	570	474	444	580	P
115	F	24	626	643	524	567	604	P
116	F	31	633	696	599	589	731	P
117	F	20	405	396	366	422	437	P
118	F	22	294	396	391	422	421	P
119	F	21	453	503	499	480	604	P
120	F	22	626	636	599	567	572	P
121	F	45	716	663	608	676	635	P
122	F	34	536	556	624	575	508	P
123	F	33	398	343	366	415	469	F
124	F	20	515	530	508	589	604	P
125	F	38	792	750	699	683	675	P
126	F	29	453	463	524	560	572	P

APPENDIX B

DATA BASE FOR EXPERIMENTAL GROUP

TABLE V

COMPLETE DATA BASE FOR MULTIMEDIA INSTRUCTION METHOD

(GRADUATING CLASS OF 1974)

Student Code	Sex	Age	Medical Nursing	Surgical Nursing	Obstetrical Nursing	Pediatric Nursing	Psychiatric Nursing	Pass/ Fail
127	F	22	594	527	525	528	641	P
128	F	23	573	541	553	621	568	P
129	F	26	552	564	553	536	559	P
130	F	46	594	615	597	536	577	P
131	F	43	720	674	636	691	650	P
132	F	28	678	637	534	590	604	P
133	F	21	545	549	451	559	677	P
134	F	20	587	549	664	497	613	P
135	F	21	454	327	220	396	504	F
136	F	23	559	586	525	528	541	P
137	F	20	356	409	433	350	632	P
138	F	27	657	623	562	551	486	P
139	F	27	643	468	617	536	541	P
140	F	26	545	460	433	435	404	P
141	F	22	531	490	516	466	504	P
142	F	27	510	460	396	512	459	P
143	F	23	650	674	599	582	686	P
144	F	25	363	497	433	396	459	P
145	F	21	496	564	479	458	677	P
146	F	22	398	460	303	412	459	F
147	F	22	566	534	553	559	650	P
148	F	26	608	652	590	636	677	P
149	F	32	482	468	470	574	559	P
150	F	49	426	431	488	450	613	P
151	F	20	350	394	470	443	532	P
152	F	38	657	674	691	683	741	P
153	F	23	657	578	617	613	595	P

TABLE V (Class of 1974) Continued

Student Code	Sex	Age	Medical Nursing	Surgical Nursing	Obstetrical Nursing	Pediatric Nursing	Psychiatric Nursing	Pa / Fail
154	F	25	510	600	516	489	304	[illegible]
155	F	37	580	586	599	551	668	P
156	F	23	510	608	507	512	522	P
157	F	32	706	652	636	613	595	P
158	F	22	447	482	451	388	459	P
159	F	22	489	519	479	512	495	P
160	F	21	524	468	470	512	577	P
161	F	20	405	519	414	474	450	P
162	F	32	657	645	701	644	650	P
163	F	36	678	586	581	636	422	P
164	F	20	636	586	553	559	613	P
165	F	34	608	519	581	[illegible]	486	P
166	F	20	594	578	654	598	532	P
167	F	26	594	556	664	652	632	P
168	F	24	706	504	488	605	595	P
169	F	21	419	394	442	427	386	P
170	F	25	657	541	599	567	550	P
171	F	29	594	519	627	536	641	P
172	F	38	622	615	562	675	577	P
173	F	44	531	504	442	574	577	P
174	M	24	748	741	654	644	714	P
175	F	19	370	445	368	373	422	P
176	F	24	482	475	350	388	431	P
177	F	19	608	667	581	660	504	P
178	F	49	720	711	728	706	704	P
179	F	19	440	497	414	443	532	P
180	F	21	797	600	627	667	613	P
181	F	20	517	482	507	443	577	P
182	F	31	720	711	710	768	750	P

TABLE V (Class of 1974) Continued

Student Code	Sex	Age	Medical Nursing	Surgical Nursing	Obstetrical Nursing	Pediatric Nursing	Psychiatric Nursing	Pass/ Fail
183	F	19	531	504	442	481	568	P
184	F	31	608	637	581	582	577	P
185	F	20	510	438	516	450	522	P
186	F	21	692	512	590	605	568	P
187	F	29	608	519	525	505	495	P
188	F	32	622	556	571	598	677	P
189	F	26	482	438	368	489	377	P
190	F	42	601	527	617	598	641	P
191	F	22	601	652	571	582	613	P
192	F	30	538	468	544	528	486	P
193	F	22	580	586	553	605	577	P
194	F	20	433	445	479	381	431	P
195	F	32	622	586	571	613	595	P
196	F	26	713	755	728	722	750	P
197	F	21	545	534	544	551	532	P
198	F	26	594	504	507	458	532	P
199	F	20	496	468	322	520	450	F
200	F	38	685	652	617	667	668	P
201	M	22	468	519	516	450	568	P
202	F	23	426	578	377	512	386	P
203	F	39	685	674	691	737	750	P
204	F	34	629	541	571	598	613	P
205	F	50	531	504	470	512	504	P
206	M	28	496	600	553	605	577	P
207	F	37	457	504	497	551	668	P
208	F	20	510	431	460	505	504	P
209	F	21	482	556	470	466	541	P
210	F	50	322	386	340	427	413	F
211	F	20	538	482	544	443	632	P

TABLE V (Class of 1974) Continued

Student Code	Sex	Age	Medical Nursing	Surgical Nursing	Obstetrical Nursing	Pediatric Nursing	Psychiatric Nursing	Pass/ Fail
212	F	21	594	637	627	613	604	P
213	F	32	601	637	581	598	723	P
214	F	20	657	733	599	660	677	P
215	F	25	629	637	599	543	650	P
216	F	27	537	571	599	613	613	P
217	M	23	440	460	488	466	504	P
218	F	50	615	564	636	574	704	P
219	F	20	454	512	451	450	550	P
220	F	23	489	623	581	559	595	P
221	F	22	559	623	562	590	604	P
222	F	30	622	608	617	760	668	P
223	F	35	657	645	553	598	632	P
224	F	35	594	615	701	667	641	P
225	M	22	566	571	562	598	559	P
226	F	22	603	534	516	543	632	P
227	F	28	713	659	728	737	777	P
228	F	21	594	608	507	621	532	P
229	F	37	350	313	442	404	340	F
230	F	20	426	549	414	458	532	P
231	F	24	531	490	396	520	522	P
232	F	20	524	468	488	450	377	P
233	F	24	650	593	636	636	613	P
234	F	52	629	586	617	598	641	P
235	F	22	454	394	488	489	495	P
236	F	21	608	527	599	706	632	P
237	F	37	608	571	627	512	623	P
238	F	36	678	556	617	644	686	P
239	F	38	664	556	673	559	714	P
240	F	22	426	394	377	311	413	F

TABLE V (Class of 1974) Continued

Student Code	Sex	Age	Medical Nursing	Surgical Nursing	Obstetrical Nursing	Pediatric Nursing	Psychiatric Nursing	P/F
241	F	21	405	423	313	450	513	F
242	F	23	496	578	581	512	532	P
243	F	29	496	482	569	505	595	P
244	F	23	552	608	544	582	641	P
245	F	22	629	645	664	706	650	P
246	F	22	461	379	414	481	413	P
247	F	23	433	468	442	435	568	P
248	F	26	517	608	599	636	677	P
249	F	38	517	527	599	528	541	P
250	F	21	398	357	359	311	386	F
251	F	21	720	719	645	698	532	P
252	F	29	545	652	654	683	714	P
253	F	25	664	564	617	636	641	P
254	F	25	517	637	590	455	386	P
255	F	21	426	350	340	373	459	F

APPENDIX C

THE STATISTICAL COMPUTATIONS AND DATA-BASE FOR EACH STATISTICAL TEST OF THE HYPOTHESIS

T A B L E V I

STATISTICS OF MEDICAL NURSING SCORES

Data	Experimental Group	Control Group
Mean	557.170	541.653
Mode	594.000	550.000
Minimum	322.000	229.000
Maximum	797.000	792.000
Standard error	8.718	9.058
Standard deviation	99.017	102.084
Median	560.750	544.500
Variance	9804.313	10421.051
Range	475.000	563.000

t-TEST FOR MEDICAL NURSING

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{n_1 s_1^2 + n_2 s_2^2}{n_1 + n_2 - 2} \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$t = \frac{557.170 - 541.653}{\sqrt{\frac{129\ (9804.313) + 127\ (10421.051)}{129 + 127 - 2} \left(\frac{1}{129} + \frac{1}{127}\right)}}$$

$$t = 1.299$$

TABLE VII

CHARACTERISTICS OF SURGICAL NURSING SCORES

Data	Experimental Group	Control Group
Mean	546.527	534.417
Mode	586.000	396.000
Minimum	313.000	264.000
Maximum	755.000	750.000
Standard error	8.015	9.183
Standard deviation	91.033	103.486
Median	551.250	541.625
Variance	8287.000	10709.449
Range	442.000	486.000

t-TEST FOR SURGICAL NURSING

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{n_1 S_1^2 + n_2 S_2^2}{n_1 + n_2 - 2} \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$t = \frac{546.527 - 534.417}{\sqrt{\frac{129\ (8287.000) + 127\ (10709.449)}{129 + 127 - 2} \left(\frac{1}{129} + \frac{1}{127}\right)}}$$

$$t = 1.046$$

TABLE VIII

CHARACTERISTICS OF OBSTETRIC NURSING SCORES

Data	Experimental Group	Control Group
Mean	536.077	523.622
Mode	599.000	537.000
Minimum	220.000	242.000
Maximum	728.000	763.000
Standard error	8.926	8.985
Standard deviation	101.383	101.258
Median	553.000	523.750
Variance	10278.555	10253.281
Range	508.000	521.000

t-TEST FOR OBSTETRIC NURSING SCORES

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{n_1 S_1^2 + n_2 S_2^2}{n_1 + n_2 - 2}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$t = \frac{536.077 - 523.622}{\sqrt{\frac{129\ (10278.555) + 127\ (10253.281)}{129 + 127 - 2}\left(\frac{1}{129} + \frac{1}{127}\right)}}$$

$$t = 1.034$$

TABLE IX

CHARACTERISTICS OF PEDIATRIC NURSING SCORES

Data	Experimental Group	Control Group
Mean	546.101	533.212
Mode	512.000	546.000
Minimum	311.000	286.000
Maximum	768.000	766.000
Standard error	8.609	8.763
Standard deviation	97.783	98.750
Median	548.000	540.500
Variance	9561.449	9751.531
Range	457.000	480.000

t-TEST FOR PEDIATRIC NURSING

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{n_1 S_1^2 + n_2 S_2^2}{n_1 + n_2 - 2}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$t = \frac{546.101 - 533.212}{\sqrt{\frac{129\ (9561.449) + 127\ (9751.531)}{129 + 127 - 2}\left(\frac{1}{129} + \frac{1}{127}\right)}}$$

$$t = 1.104$$

TABLE X

CHARACTERISTICS OF PSYCHIATRIC NURSING SCORES

Data	Experimental Group	Control Group
Mean	568.232	525.449
Mode	532.000	572.000
Minimum	304.000	326.000
Maximum	777.000	767.000
Standard error	8.665	8.257
Standard deviation	98.418	93.048
Median	576.719	515.250
Variance	9686.086	8657.867
Range	473.000	441.000

t-TEST FOR PSYCHIATRIC NURSING

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{n_1 S_1^2 + n_2 S_2^2}{n_1 + n_2 - 2}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$t = \frac{568.232 - 525.449}{\sqrt{\frac{129(9686.086) + 127\ (8657.867)}{129 + 127 - 2}\left(\frac{1}{129} + \frac{1}{127}\right)}}$$

$$t = 3.760$$