

A STUDY OF THE EFFECTS ON LEARNING OF
MATCHING THE COGNITIVE STYLES OF STUDENTS AND
INSTRUCTORS IN NURSING EDUCATION

Thesis for the Degree of Ph. D.
MICHIGAN STATE UNIVERSITY
CRYSTAL MARIE LANGE

1972



This is to certify that the
thesis entitled
A STUDY OF THE EFFECTS ON LEARNING OF MATCHING
THE COGNITIVE STYLES OF STUDENTS AND INSTRUCTORS IN
NURSING EDUCATION presented by
Crystal Marie Lange

has been accepted towards fulfillment
of the requirements for

PHD degree in Education

Date 8/11/72

C 149

~~Ref~~ 324 pl4

K ~~1975~~ H4

~~1976~~ 102

~~920 1798~~ 60

~~1976~~ 328

ABSTRACT

A STUDY OF THE EFFECTS ON LEARNING OF MATCHING THE COGNITIVE STYLES OF STUDENTS AND INSTRUCTORS IN NURSING EDUCATION

By

Crystal Marie Lange

Purpose

The purpose of this study was to identify the effects on learning of matching student's cognitive styles and preferred teaching style with instructor's cognitive style and teaching style. The cognitive style of 255 nursing students and the cognitive style of 33 nursing faculty was determined. The teaching style of faculty was identified and each student indicated a preferred teaching style. A model was developed as a potential mathematical method for matching the cognitive style of teacher and student. Students were assigned to faculty on the basis of matching cognitive style factors. Achievement and reactions of matched students was compared with the achievement and reactions of non-matched students.

Summary

Students in this study included all the men and women

enrolled in the second nursing course during the winter semester, 1972 at Delta College, University Center, Michigan. Faculty for the study included all the full time and part time faculty who were teaching students in the clinical laboratory for the second nursing course. The measures used in this study included: 1) cognitive style testing, 2) identification of teaching style, 3) faculty interviews, 4) test scores and final course grades, 5) student evaluations of the faculty, and 6) teacher rating scales of cognitive style.

A statistical hypothesis was formulated and nine "hypotheses generating" questions. The hypothesis this study tested was: When students' cognitive style and preferred teaching style is matched with the instructor's cognitive style and teaching style, the frequency of failure-withdrawal in that course will not be less than the failure-withdrawal rate for non-matched students. The Kolmogorov-Smirnov statistical test was used to test this hypothesis for significance at the alpha level of .05 with appropriate degrees of freedom. The t-test for significance of difference between means, and the Pearson r correlation coefficient were used to test additional data collected to answer the nine "hypotheses generating" questions.

Conclusions

The analysis of the data supports the following conclusions:

1. When the cognitive style and preferred teaching style of students is matched with the cognitive style and teaching style of faculty the failure-withdrawal rate is not significantly different when compared to the baseline data.

2. When the cognitive style and preferred teaching style of students is matched with the cognitive style and teaching style of faculty, the failure-withdrawal rate of one matched group was significantly different from the non-matched group.

In the process of testing the research hypothesis, nine additional hypotheses emerged which were stated in the form of questions for further study. The data examined in this study supports the following tentative conclusions in anticipation of further investigation:

1. Matched students do, to a significant degree, perceive their instructor more positively than do the non-matched students.

2. Matched students do achieve higher mean scores in final course grades than do the non-matched students. The group of students in Group I, where the investigator was the faculty team leader, consistently achieved at a significantly higher level than Group II.

3. Students who were assigned an instructional mode based on their cognitive style achieved at a level close to their prior achievement on similar types of learning. One

group, the small discussion group, did show an increase over prior mean scores.

4. Students reacted favorably to the assignment of an instructional mode based on their cognitive style. Students viewed the experience as a welcome change and would prefer to have a choice among instructional modes for each lesson. They viewed the lesson as taking less time to learn and more enjoyable.

5. Faculty perceive the matching of student's cognitive style with the instructor's cognitive style as a valuable tool. Cognitive style matching was perceived by 70% of the faculty (10) to be a helpful tool in the teaching-learning process. The continuation of cognitive style matching was recommended by 62% of the faculty (8). An additional benefit cited by the faculty was the improved communication among the faculty and an increased tolerance for behaviors which might ordinarily be more criticized than understood.

6. The greater the number of cognitive style elements a student has, the greater is the possibility of passing in the nursing courses. An analysis of the elements absent from the cognitive style maps indicated students who achieved "A" grades had the least number of missing elements. Students who have reading level below 4.0 failed in the first nursing course, although students with higher reading level also failed. Evidence relative to predicting success in the nursing course is inconclusive at this time.

7. Student's cognitive style maps do change, based on the findings of the numerical analysis of the cognitive style maps for students who had two "testings." It was not possible to predict the direction of the changes or augmentations although there were more changes in the direction of the instructor's cognitive style.

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A THESIS

Submitted to
Michigan State University
In partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Instructional Development and Technology

1972

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1972

ACKNOWLEDGEMENTS

An undertaking, such as the doctoral program, really involves many people who help to make it happen. The dissertation is the final evidence, perhaps more tangible than the inspirational sources that nurtured its development and final birth.

The students at Delta College in the nursing program have been the reason for and the answers to this study. Although they may feel nameless, each one has made an important contribution to this study. I appreciate their honest assistance and open contributions. Hopefully, the improved teaching-learning of future students will make it all worthwhile.

The faculty members in the nursing program have contributed in meaningful ways. They have challenged, asked questions, supported, resisted, and behaved in most of the usual human ways that consistently provide the necessary positive and negative feedback to keep any investigator honest. I truly appreciate their valuable contributions and personal encouragement.

From my committee I have received precisely the appropriate combinations of encouragement, questioning and support. Dr. Joseph E. Hill has provided the knowledge,

experience, and enthusiasm relative to the Educational Sciences. Dr. Isabelle Payne shared her knowledge and experience related to nursing education. The value of disciplined research techniques has consistently been emphasized by Dr. Donald Olmstead. My committee chairman, Dr. Charles F. Schuller, has been consistently predictable in his support, assistance and encouragement.

From the outset of this venture, my husband, Elmer, has made educational pursuit possible through his encouragement and help. Our seven children have each contributed to the ultimate completion of this task. Our daughter, Helen, spent many hours typing the original manuscript. I am grateful to each one of them and appreciate their faith and support in helping me complete the program.

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	ii
LIST OF TABLES	v
LIST OF FIGURES	vi
LIST OF APPENDICES	vii
Chapter	
I. THE PROBLEM	1
Need	1
Purpose	12
Hypothesis	13
Theory	13
Definition of Terms	21
Overview	29
II. REVIEW OF RELATED LITERATURE	31
III. DESIGN OF THE STUDY	53
Sample	56
Measures	58
Design	76
Testable Hypothesis	86
Summary	88
IV. ANALYSIS OF DATA	89
Analysis	89
Summary	115
V. SUMMARY AND CONCLUSIONS	116
Summary	116
Discussion	122
Recommendation	122
BIBLIOGRAPHY	127
LIST OF APPENDICES	133

LIST OF TABLES

Table	Page
1. Final Grades of Students in the Second Nursing Course Compared to Baseline Data	89
1.2. Comparison of Final Grades of Matched and Non-Matched Students in the Second Nursing Course	91
2. Comparison of Students' Perception of Instructor in Matched and Non-matched Groups	93
3. Statistical Comparison of Students' Perception of Instructor in Matched and Non-matched Groups	94
4. Comparison of Mean Final Scores of Matched and Non-matched Groups in the Second Nursing Course	96
5. Comparison of Prior Mean Scores with Current Mean Scores for Groups Assigned Different Instructional Modes According to Cognitive Style	99
6. Comparison of Mean Scores among Groups Assigned Different Instructional Modes . . .	101
7. Faculty Reaction to Cognitive Style Matching	106

LIST OF FIGURES

Figure	Page
1. Rate of Pass, Fail & Withdrawal in First Two Nursing Courses at Delta College 1966-1970	8
2. Continuum of Symbolic Conditions	50
3. Research Design	78

LIST OF APPENDICES

Appendix	Page
A. Identification of Teaching Style.	134
Faculty Form	135
Student Form	136
Summary of Teaching Styles	137
B. Teacher's Rating Scale: Students of Nursing	138
C. Nursing Student Survey Form	150
D. Nursing Faculty Survey Form	159
E. Summary of Selected Reasons for Section Transfer	162
F. Treatment Lesson Quiz and Student Reaction Form.	164
G. Baseline Data	169
H. Summary of Increases and Decreases in Cognitive Style Elements Comparing Two Testings	171
I. Elements Absent from the Cognitive Style of Passing and Failing Nursing Students.	173
J. Summary of Changes in Cognitive Style According to Instructor Matching for Two Testings	175
K. Summary of Reading Levels	178
L. Elements Missing in Cognitive Style According to Final Course Grades in Nursing	180
M. Changes in Student's Cognitive Style Maps in Relation to Last Instructor.	182

CHAPTER I

THE PROBLEM

Need

In a nation that speaks of inalienable rights, the right to learn must be paramount, asserts John Goodlad, yet it has been denied because of habitual adherence to many unproductive teaching concepts and practices. Goodlad further claims the failures of our schools are apparent in dropout rates, in barely minimal learning on the part of many who do remain in school, and in increasing alienation among the young of all colors and classes. At the root of the problem is an implicit denial of diversity or individuality. Learners are molded, directed and judged according to a narrow conception of what is right and appropriate. Energy and talent is channeled through a network of expectations, rules, grades, required subjects and rewards for appropriate behavior and subtle extinction of a range of talents and achievements considered inconsequential.¹

Academic ability of students is one of the best researched areas in higher education according to Cross, yet

¹John I. Goodlad, "Learning into the Twenty-First Century," The Report of the President, 1970 White House Conference on Children, The Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, p. 1.

part of the challenge for the community college is dealing with a new kind of student for whom traditional measures of ability may not be appropriate. Now that education is changing to meet the needs of new students, testing programs must change to meet the needs of new educational programs.²

Numerous innovative practices are described by Torkelson to be used in the learning process. Students are able to use a wide assortment of technologies in order to "get" the content of a particular lesson. A student may use a motion picture film, slides, audio tape recording, printed materials or manipulate actual objects as directed by the instructor for a particular sequence of learning. Some instruction allows the student to select his own time for learning and spend the time he determines is needed to achieve specified objectives. A computer is able to present learning materials to students and keep a continuous record of the individual student's progress. Television cameras may record the student's activities and allow him to see himself perform and to evaluate his own activities. Students meet in large groups, small groups, clinical laboratories, and in individualized audio-tutorial

²K. Patricia Cross, The Junior College Student: A Research Description, Educational Testing Service, Princeton, New Jersey 08540, 1968, p. 13.

settings in order to meet prescribed learning objectives.³

The described innovations have been adopted more in some fields of study than in others. In higher education, a number of institutions have conducted investigations to determine the relative effectiveness of specific mediated approaches to learning as compared with traditional approaches. Across the United States, technological innovations have met with considerable acceptance as evidenced by the development of learning resource centers and expanded use of media materials in higher education. Nursing education, as a part of the higher education system, has also been involved in the use of the newer technologies to extend the teaching skills of faculties to larger numbers of students. A brief survey of the listing of special project grants awarded for nursing education indicates almost every jurisdiction of the United States has some type of grant for the stated purpose of developing, using, and/or evaluating a technological innovation. A sampling of project titles includes, "Development of Multimedia Materials and Methods for Programmed Learning in Nursing," "Laboratory for Independent Nursing Knowledge - LINK," "A Strategy Emphasizing Self-Instruction Through Educational Technology," and

³Gerald M. Torkelson, "Technology: New Goals for Individualization," Educational Leadership, Vol. 29, No. 4, January 1972, p. 315-318.

"Utilization of Television for the Improvement of Instruction in Basic Skills in Nursing on a Statewide Basis in Florida."⁴

The relative ability of the newer technologies to retain nursing students in the program to successful completion and graduation has not been clearly identified. When the number of entering students are compared to the numbers of graduating students for that same class, the loss of students between entry and graduation is considerable.

Each year the National League for Nursing conducts a survey of admissions, enrollments, and graduations for all state-approved programs in nursing in each jurisdiction of the United States.⁵ Response rates to the survey are reported as 100 percent in all basic nursing programs. In examining the figures for admissions and graduations from programs in institutions of higher education (baccalaureate degree and associate degree), approximately 50 percent of the admitted students are graduated.⁶

⁴Special Project Grants Awarded for Improvement in Nurse Training, July 1970, U. S. Department of Health, Education, and Welfare, Public Health Service - National Institutes of Health, Bureau of Health Professions Education and Manpower Training, Division of Nursing, Bethesda, Maryland 20014, p. 1-66.

⁵"Education Preparation for Nursing -- 1970," Nursing Outlook, September 1971, p. 604.

⁶Ibid.

The student who enters but does not complete the nursing program often represents a large investment of institutional and student energies, time, and money. Winther and Potter carried out a longitudinal study of a beginning freshman class (nursing students) at the University of New Mexico in Albuquerque, New Mexico.⁷ They report more than half of the nursing students attending the University of New Mexico drop out and the proportion has not significantly changed over 15 years. Their study supports the loss of nearly 50 percent before graduation as reported by the National League for Nursing.

According to a recent report from Laney College in Oakland, California, the dropout rate is one of the most devastating problems facing community colleges.⁸ Another community college nursing program in North Carolina also reports, "The faculty has worked hard during the past two years and has done a tremendous job in developing their ideas into effective media for student learning. Students have responded positively to the system and the majority of them feel it is the only way to learn. Achievement Tests

⁷Sven F. Winther and E. Bruce Potter, The Drop Out, A Longitudinal Study of Beginning Freshman Class of 1963. University College and Counseling Center, University of New Mexico, Albuquerque, New Mexico, December 1970.

⁸"Laney College, Oakland, California," Jottings from the League for Innovation in the Community College, Number 11, May 31, 1972, p. 5.

and State Board Test Scores support the system as being more effective than our previous methods. However, we have not significantly reduced our attrition rate."⁹

A similar problem exists at Delta College, University Center, Michigan, where this investigator has been teaching nursing students for the past several years. A three-year project was undertaken to develop and use audiovisual materials in order to achieve the project objectives:

1) release the instructor for individual student teaching in the patient care facility, 2) utilize faculty in teaching greater numbers of students, without loss of instructional quality, 3) permit the student to proceed at his own speed to develop the competencies in nursing, and 4) facilitate the use of the materials developed on a local, regional, and/or national basis, in institutions conducting nursing education programs.¹⁰

The project goals have been achieved and the developed film materials have a national and international distribution to date, but the number of students who are unsuccessful or drop out continues to be relatively constant and is of major concern to students, faculty, and administration.

⁹Personal letter from the Chairman, Department of Nursing, Central Piedmont Community College, Charlotte, North Carolina, June 23, 1971.

¹⁰Luis E. Folgueras, The Use of the Auto-Tutorial Laboratory and the Mobile Tutorial Unit in Teaching Nursing Techniques. Delta College, University Center, Michigan, 1969, p. 5.

A survey of the nursing course grades earned by students over a five-year period indicates that at the end of the second course the mean failure-withdrawal rate is 36 percent. Of the students entering the first nursing course, approximately 64 percent successfully complete the second nursing course, and two additional courses are required for graduation. Usually the major losses are in the first two courses, but by graduation time the Delta program often meets the national figure of approximately 50 percent attrition. An examination of Figure 1 indicates well over the 50 percent mark with 57 percent failed or withdrew in 1966. The group entering in 1967 were the first class to use mediated materials under experimental conditions with the advantage of additional faculty funded under project provisions. There is a decrease in the failure-withdrawal rate with the class of 1967 to 22 percent followed by a leveling off of at 29 to 34 percent in the next three years in spite of more than triple increase in enrollment.

While the Delta College nursing faculty believe the use of mediated learning approaches is effective, they would like to decrease the failure-withdrawal rate of students from the nursing courses. In the search for possible solutions to the failure-withdrawal situation in the nursing education program at Delta College, this investigator explored the techniques in use at Oakland Community College. Considerable improvement in student performance had been demonstrated through a system of matching the learning styles

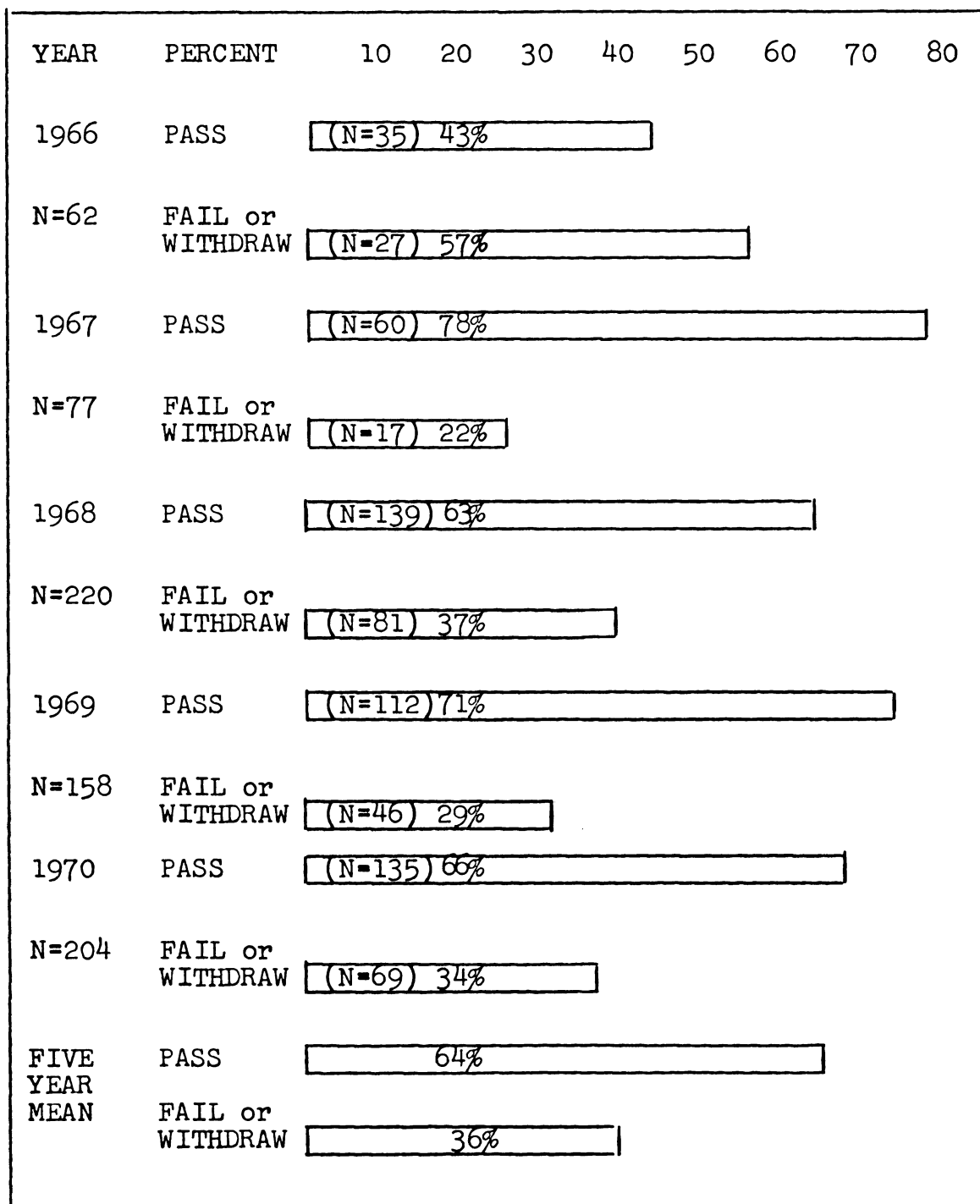


Figure 1.--Rate of Pass, Fail & Withdrawal
in First Two Nursing Courses at
Delta College 1966 - 1970.

* Data from Final Course Grade Sheets

of students with appropriate instructors and learning experiences. The system appeared to provide a degree of potential for use in the nursing education setting. If the techniques of matching learning styles and teaching styles had proven effective for students at Oakland Community College, Bloomfield Hills, Michigan, perhaps a similar approach in nursing education would produce positive results.

At Oakland Community College each incoming student participates in a diagnostic program designed to measure his ability to derive meaning from quantitative symbols (sensory and code data). He will walk a line, assemble shapes, match patterns, taste chocolate and sniff odors as part of the diagnostic program. He will also undertake a battery of written tests to determine his ability to handle theoretical symbols (words and numbers). The outcome of the diagnostic tests are translated into elements of the individual's cognitive map, a picture of the ways in which he derives meaning from his environment and experiences. An orientation program explains the cognitive map and provides students with insight regarding their abilities and limitations. The orientation program concentrates on the implications of cognitive styles for achievement of educational tasks and selection of specific vocational pursuits.¹¹

¹¹Blueprint for Personalized Education, Oakland Community College, 2480 Opdyke Road, Bloomfield Hills, Michigan 48013, p. 2.

An in-service training program at Oakland Community College is provided to assist faculty in translating knowledge of the cognitive styles of students into personalized educational programs. The diagnostic testing of the faculty's cognitive and teaching styles furnishes self-knowledge needed to the construction of positive relationships with students. An attempt is made to match the cognitive styles of students with that of faculty members.¹²

Oakland Community College asserts that the full benefits of using cognitive style can be achieved when educational programs are restructured to use different combinations of methods and media based on a knowledge of students' needs and abilities as indicated by his cognitive map. Course educational objectives remain constant, but the route to their achievement is varied through individualized learning sequences developed jointly by the student and instructor. A computer is available to help match the cognitive style of the student to the appropriate instructional mode.¹³

Large informal learning areas called Carrel Arcades are available with a variety of learning activities (e.g., viewing of video tape recordings, listening to audio tape

¹²"Blueprint for Personalized Education," Op. Cit., p. 4.

¹³Ibid., p. 4.

recordings, participating in small group seminars and tutoring sessions). Paraprofessionals provide supportive services in the Carrel Arcades.¹⁴

Individualized programed learning labs at Oakland Community College provide personalized prescriptions for improvement of academic deficiencies (reading, math, listening, and others). Programed materials are selected on the basis of the student's reading level and his cognitive style. The materials are constructed in stages of increasing difficulty and rapid feedback of learning achievement is provided. A wide range of materials are used in conjunction with the programed materials such as three dimensional models, film strips, reading machines, portable tachistoscopes, and Language Masters. Students receive guidance from faculty members specially trained in individualized instructional techniques.¹⁵

From the integration of these specifications has evolved a program that maximizes the successful achievement of educational goals for students as indicated by a lowered failure rate at Oakland Community College to less than 10 percent as compared with the national failure rate estimated by the American Association of Junior Colleges to be in excess of 50 percent.¹⁶ At Oakland Community College,

¹⁴Ibid., p. 4.

¹⁵Ibid., p. 5.

¹⁶Ibid., p. 5.

Varone and Wells reported a Summer Science Institute which began with 32 students (from nine public high schools and one parochial school) and ended seven weeks later with 30 students receiving certificates of successful completion. The students and faculty followed the described design with the use of cognitive style maps and specifically prescribed learning experiences.¹⁷

In considering the urgent need to decrease the failure-withdrawal rate of nursing students at Delta College and the potential of the techniques developed at Oakland Community College, the purpose of this study has become apparent.

Purpose

The purpose of this study is to identify possible impacts on student success of matching students' cognitive styles and preferred teaching style with instructor's cognitive style and teaching style. The cognitive style of selected nursing students and the cognitive style of selected nursing faculty will be determined. The teaching style of faculty will be identified and each student will indicate a preferred teaching style. A model will be developed as a potential mathematical method for matching the

¹⁷Memorandum to Mr. S. J. Manilla, Provost, Oakland Community College from A. Varone and R. Wells, Department of Physical Science, regarding Summer Science Institute, dated October 11, 1971.

cognitive style of student and teacher. Selected students will be assigned to selected faculty by matching cognitive style factors. Achievement of matched students will be evaluated and compared with non-matched students. The reactions of students and faculty to cognitive style matching will be recorded.

Hypothesis

The hypothesis to be tested in this study: Students in the associate degree nursing program at Delta College have decreased withdrawal* and/or failure rate in a nursing course when student's cognitive style and preferred teaching style are matched with instructor's cognitive style and teaching style.

In the process of testing the research hypothesis it is proposed that additional hypotheses will emerge to be stated in the form of questions for further investigation. The answers to the "hypotheses questions" will provide direction regarding the potential use of cognitive style in the teaching-learning process.

Theory

Cognitive style maps are derived from multiple inputs as described in the diagnostic procedures at Oakland Community College. The development of cognitive style

*Analysis of the reasons for withdrawal indicate over 97% of the withdrawals are for academic failure and less than 3% are for personal reasons.

is described as one of the seven educational sciences which has been developed and investigated by scholars at the Institute for Educational Sciences at Wayne State University and the American Educational Sciences Association at Oakland Community College. Joseph E. Hill has been one of the major proponents of the construction or makeup of cognitive style. The reliability and validity of cognitive style has been researched by several (Ecker, 1962; Saunders, 1963; Morshead, 1963; Rankin, 1964; Dehnke, 1966; Wyette, 1967; Zussman, 1968; Robinson, 1969). Recent studies have been designed to identify the uses of cognitive style as a tool for understanding selected educational phenomena. Wasser has demonstrated the significant role of cognitive style similarity (teachers and student) in the evaluation (marking) process.¹⁸

Learners seek meaning in multiple and unique ways states Wasser. Each individual has his own "style" for making sense out of his world and finding answers to the question, "What is going on and why?" The process by which individuals develop knowledge and understanding is a study for the applied field of education. The educational science of cognitive style approaches individual methods of meaning-seeking

¹⁸Joseph F. DeLoach, "Cognitive Styles and Cognitive Dissonance," Oakland Community College Press, 1971.

behavior in a manner that permits educators to communicate specifics about each student's search for meaning.¹⁹

Gordon Allport suggested the concept of "style" in his discussion of personality development. He defined "style" as the consistency and pattern of behaviors that individuals use in carrying out various activities. He states, "Style is the stamp of individuality impressed upon our adaptive behavior."²⁰ In the perspective of Allport's description of style, the term is similar to the usages referred to as: life style, speaking style, writing style, or style of dress. In this orientation style refers to a pattern of responses which may be both general (i.e., life style) or more specific (i.e., writing style).

The construction or makeup of cognitive style used in the Educational Sciences is different from those defined in the field of psychology. From the Educational Sciences perspective, cognitive style is made up of the particular ways in which an individual becomes acquainted with or gains knowledge about a given entity or situation. A brief description of the elements contained in cognitive style will clarify the theoretical basis of this study.

¹⁹Laurence Wasser, "The Educational Science of Cognitive Style: An Introduction", Oakland Community College Press, 1971.

²⁰Gordon Allport, Becoming (Basic Considerations for a Psychology of Personality). New Haven: Yale University Press, 1955, p. 78.

The educational science of cognitive style is made up of four sets of related sciences: 1) symbologosics or the science of symbols and their meanings, 2) determantics or the science of cultural determinants in the meaning of symbols, 3) inferensics or the science of modalities of inference, and 4) the science of biochemical and electrophysiological components of memory.²¹ Since the fourth set is presently still in developmental stages, only the first three sets will be considered.

Symbologosics, the science of symbols and their meaning, includes two types of symbols: 1) theoretical symbols such as words and numbers, and 2) qualitative symbols such as smell, taste, and sensory input as described by Wasser. The theoretical symbol represents something different than the symbol itself and may include concepts and ideas. Theoretical symbols include visual and auditory symbols. A theoretical symbol might be the written word "chair" or the spoken word "chair" which is the symbol for the object usually used for sitting. The theoretical symbol represents the object or the idea ordinarily associated with the symbol, it is not the object itself. Qualitative symbols present sensory experiences to the individual; such as, "Ice feels cold," or "I smell smoke." Qualitative symbols are associated with the perception senses: auditory, visual, tactile,

²¹Wasser, "Educational Science," Op. Cit., p. 5.

savory, and olfactory. Qualitative symbols derive meaning from three sources which include: 1) sensory stimuli (the items you taste, smell, hear, feel), 2) humanly constructed formalisms (games or codes such as red light associated with the act of stopping at a corner), and 3) programmatic effects (a synthesis of stimuli produced within the body which is manifest in an intelligent behavior **such as** typing or driving a car).²²

Determantics, cultural determinants of the meaning of symbols, considers the family, associates, and individuality of a person to be the cultural influences on what one perceives and understands. Each of the determinants influences the individual's interpretation of symbols pertaining to a selected educational task although, according to Wasser, the relative strength of its influence may vary with the age of the learner and the conditions of the learning task. The young learner may be more influenced by family in the early learning of theoretical symbols such as "love." Later in his development, associates may exert greater influences on the meaning he attaches to symbols. The individuality of a person may be a greater influence in selected situations according to the educational task. The determinants are influencing factors in any effort to educate an individual since they affect the meanings the learner attaches to specific symbols.²³

²²Wasser, "Educational Science," Op. Cit., p. 6.

²³Ibid., p.8-10.

Inferensics, the educational science of modalities of inference, deals with the several ways of producing meaning from the theoretical and qualitative symbols. Inferensics are made up of both deductive and inductive inference processes. Inference consists of both the process and the product. It is the process employed to derive a conclusion and it is the conclusion which is derived from the information or data.²⁴ An inductive process gives an experienced-based probability conclusion of the kind man makes in many situations. For example, if the light is green on your side of the cross street, and there are no cars visible, it is probably safe for you to cross the street. If the patient has a temperature elevation, has a pulse increase, an elevated white blood count, and appears flushed, there is probably some type of infectious process going on in part of the body. A deductive process produces a conclusion which is a consequence resulting from a particular chain of reasoning, such as the process used in mathematics.²⁵

Diagnosis of Cognitive Style determines an individual's orientations in each of the three sets in the educational science of cognitive style to identify his strengths at a

²⁴Ibid., p. 11.

²⁵Ibid., p. 12.

given level of educational development according to Schroeder.²⁶ Teachers can learn the techniques of diagnosis. Empirical mapping of cognitive styles (recording the findings in a meaningful format, or map) is an activity for a diagnostician or empirical "mapper." Behaviors are classified on a "make sense" of "does not make sense" basis in relation to the defined elements. This method is similar to the role of the medical doctor in diagnostic activities.²⁷

The diagnostic tools include direct and indirect measures of each of the three sets which make up the individual's cognitive style.²⁸ Direct measurements are interpretations of behavior observed by the diagnostician. A team of diagnosticians will improve the reliability of direct measurements. Indirect measurements are interpretations of behavior through an examination of selected data related to the individual. Test instruments are being refined for the indirect measurement of cognitive style. The specific elements identified in a student's cognitive style are the strengths to be used in the process of his education.

²⁶Arlan V. Schroeder, "Cognitive Style: The Key to Student Placement?" Oakland Community College Press, 1971.

²⁷Ibid., p. 3.

²⁸Ibid., p. 4.

The individual student's cognitive style provides information to the teacher in selecting instructional materials and processes most appropriate for a particular student to achieve a given educational task.²⁹

Instructional Prescriptions: The diagnosed cognitive style provides information for the teacher and the student to prescribe specific instructional activities that insure with high probability that the student will successfully accomplish a specific educational task. The cognitive style of the individual is directly related to the educational level and cultural background of the individual as well as the symbolic conditions of the specific learning task. The diagnostician must analyze the student as well as the demands of the educational task to be achieved. Cognitive style provides a means of analyzing, interpreting, and evaluating educational content in a unique approach.³⁰

Much of nursing education's course work places great emphasis on the ability to read at a specific level (theoretical visual language), as indicated by the studies of

²⁹A comprehensive program of measurement for the "educational sciences" is made up of nine broadly defined areas including: 1) academic aptitude, 2) academic achievement, 3) special abilities, 4) personal interests, 5-7) family and associates relationships, social adjustment, and attitudes, 8) motor skill, 9) social activities and work experience. A detailed description is presented by Joseph E. Hill, "Selected Aspects of Measurement and Mapping," Oakland Community College Press, 1971.

³⁰Op. Cit., p. 4.

achievement.³¹ Textbooks disregard the symbolic conditions (theoretical and qualitative) of educational tasks by concentration on theoretical symbols.³² Textbooks are written at a specific level and all students are supposedly able to read at that level. The student who functions at a lower level with theoretical symbols is at a disadvantage which may lead to loss of interest, overwhelming frustration, and eventual failure or drop out. If the student could receive information he is able to handle or receive tutorial assistance to advance his ability to handle theoretical symbols, he might be encouraged to progress and even succeed.³³

Definition of Terms

Several terms and symbols are basic to the conduct of this study. Most of the terms are taken from the Educational Sciences related to cognitive style and include the following:

Cognitive Style: an individual's mode of behavior in search for meaning; a Cartesian product (G) made up of three sets: S (symbols and their meaning), E (cultural determinants of the meanings of symbols), and H (modalities of

³¹Cheryl L. Reed, John F. Feldhusen, "State Board Examination Prediction for Associate Degree Nursing Programs Graduates," Nursing Research, Vol. 21, No. 2, March-April, 1972, p. 149-153.

³²Hill, Op. Cit., p. 6

³³Ibid., p. 7.

inference). The universal (or total element) Cartesian product is represented by:

$$G = S \times E \times H$$

Since the purpose of determining an individual's orientation in each of the three sets making up cognitive style is to determine his strengths at a given level of educational development, the following principles apply:

- 1) If the percentile rank of an individual's score in a given element is in the spread of values ranging from the fiftieth through the ninety-ninth percentile (inclusively) of a population of these scores, the individual is assigned a major orientation, written as a capital letter.
- 2) If the percentile rank of an individual's score in a given element is in the spread of values ranging from the twenty-fifth through the forty-ninth percentile (inclusively) of a population of these scores, the individual is assigned a minor orientation, written as a small letter.
- 3) If the percentile rank of an individual's score in a given element is in the spread of values ranging from the zero percentile through the twenty-fourth percentile (inclusively) of a population of these scores, then the individual is assigned neither a major nor a minor orientation, and the element is

not entered as a part of the cognitive style³⁴

Applying these three principles and assigning an abbreviation to each of the elements in the three sets provides a written format to designate cognitive style. The Educational Sciences have assigned letter designations to each of the experiences and may be either auditory (spoken) or visual (written). As discussed earlier in this chapter, each of these types can be identified as linguistic (language) or quantitative (numbers). The theoretical elements include:

- 1) The Theoretical Auditory Linguistic - T(AL) - the sound of a word or graphic symbol.
- 2) The Theoretical Auditory Quantitative - T(AQ) - the sound of a number or a mathematical symbol.
- 3) The Theoretical Visual Linguistic - T(VL) - the written word or graphic symbol.
- 4) The Theoretical Visual Quantitative - T(VQ) - the written number or mathematical symbol.

The qualitative symbols derive meanings from 1) sensory stimuli, 2) humanly constructed formalisms (codes or games), and 3) the programmatic effects of combinations of stimuli.

³⁴Laurence Wasser, The Educational Science of Cognitive Style: An Introduction, Oakland Community College Press, 1971, p. 8.

The qualitative symbols include:

- 1) The Qualitative Auditory - Q(A) - symbol is the perception of meaning from non-verbal sounds.
- 2) The Qualitative Olfactory - Q(O) - symbol is the obtaining of meaning from odors, smells, or aromas.
- 3) The Qualitative Savory - Q(S) - symbol is the mediation of meaning through taste.
- 4) The Qualitative Tactile - Q(T) - symbol is the gaining of meaning through the sense of touch.
- 5) The Qualitative Visual - Q(V) - symbol is the ability to derive meaning from what one sees.
- 6) The Qualitative Proprioceptive - Q(P) - symbol is the ability to combine or coordinate inputs from muscular functions into a specific response or operation which is monitored by sensory input, e.g., as in running to catch a baseball or typing from written material.

The qualitative symbolic codes are organized in a similar manner:

- 1) Qualitative Code Empathetic - Q(CEM) - is the ability to put yourself in another's place, e.g., to know how it feels when someone has pain in a surgical incision.
- 2) Qualitative Code Esthetic - Q(CES) - is the ability to enjoy the beauty of an object or an idea.
- 3) Qualitative Code Ethic - Q(CET) - is commitment to specific values or duties.

- 4) Qualitative Code Histrionic - Q(CH) - is the ability to deliberately stage behavior to produce a desired effect.
- 5) Qualitative Code Kinesics - Q(CK) - is the ability to communicate through bodily movements or peripheral vascular reactions.
- 6) Qualitative Code Kinesthetics - Q(CKH) - willingness and interest in acquiring motor skill abilities.
- 7) Qualitative Code Proxemics - Q(CP) - is the ability to judge the appropriate physical and social distance between oneself and another as defined by the other person, e.g., being able to recognize if you may put your arm around that patient or call the boss by his first name.
- 8) Qualitative Code Synnoetics - Q(CS) - is knowledge of one's abilities, i.e., being able to establish realistic goals for oneself.
- 9) Qualitative Code Transactional - Q(CT) - is the ability to establish with others a positive communication system which influences their actions or goals, e.g., to convince someone that your way is best.

The meaning brought to man by symbols is influenced by the person's culture and experiences. A person interprets the theoretical and qualitative symbols as an individual in a role that has specific expectations. These expectations

are imposed by societal norms, peers, or associates, or the family, and exert an influence over the person throughout his life. What the person perceives as the meaning of symbols is greatly determined by:

- 1) his Associates - A - or peers - this is represented by the various groups with whom the person has the greatest contact and changes throughout life.
- 2) his Family - F - this is either immediate or extended or surrogate changing throughout life.
- 3) his Individuality - I - this is the person's knowledge that his way is best along with his ability and willingness to direct his behavior accordingly.

The meanings of symbols are influenced also by the modes of inference or reasoning that the individual has a tendency to employ in an effort to formulate hypotheses. There are two classifications of modes of inference. First are the inductive processes which yield probability conclusions. Second is the deductive process which yields a logically necessary conclusion derived from the given information. There are four inductive processes, which are classified as:

- 1) Magnitude - M - is categorical thinking, i.e., using rules, definitions, and/or classifications.
- 2) Differences - D - is the emphasis of one-to-one contrasts of selected characteristics or traits.

- 3) Relationships - R - is the comparison of two or more selected characteristics or traits through similarities.
- 4) Appraisal - L - is the process involving the application of Magnitudes, Differences and Relationships in reaching a probability conclusion.

Circle K - (K) - is the deductive inferential process.

This inferential process is utilized most frequently in logical proofs, e.g., in mathematics and in symbolic logic.

Teaching Style: the consistency of a teacher's response to, and behavior in, the student-teacher relationship in the educative process. This "style" is expressed as the Cartesian product of three sets as follows:

$$\begin{matrix} \text{ts} \\ \text{(teaching} \\ \text{style)} \end{matrix} = \left\{ \begin{matrix} \text{"Demeanor"} \end{matrix} \right\} \times \left\{ \begin{matrix} \text{"Concern"} \end{matrix} \right\} \times \left\{ \begin{matrix} \text{"Symbolic} \\ \text{mode} \\ \text{of} \\ \text{Presentation"} \end{matrix} \right\}$$

In the first set "Demeanor" there are three elements that can occur in binomial combinations as major orientations, minor orientations, or other possible combinations of major-minor combinations. These elements are expressed as (P_p) "predominant," (S_s) "adjustive" and (B_b) "flexible." Each of these categories is subscripted with either authoritative (a) or permissive (p). The following notation is an example of a possible demeanor representation:

$$\begin{matrix} S_a \\ b_p \end{matrix}$$

This demeanor indicates that the teacher is "adjustive-authoritarian" in the range of 50 to 90 percent of the time while being flexible-permissive in the range of 25 to 49 percent of the time.

In the second set, "Concern," three elements occur in major, minor, or negligible orientations as they are scored over the range of 0-9 points. An element (e.g., processes) is considered to be a "major" orientation if it receives any score from 6 to 9 inclusive. The element would be considered a "minor" if it were scored in the range of 3 to 5 inclusively. Finally, the element would be rated "negligible" if it received a score from 0 to 2 inclusively. The scores referred to here can be realized by means of an observer rating these dimensions as they appear to that individual or through a variety of ratings accorded items comprising a rating-scale form of instrument.³⁵

In the last set dealing with "symbolic mode," the three symbolic conditions of an educational task are employed, and can occur in major or minor orientations according to the scoring schema associated with the elements in the "Concern" set. The modes are: Theoretical Predominance (TP), Reciprocity (REC), and Qualitative Predominance (QP) (see "cylinder and cone" representation of symbolic conditions of tasks in Chapter II).³⁶

³⁵Joseph E. Hill, Seminar Discussion at Oakland Community College, June 26, 1972.

³⁶Ibid.

When the cognitive style of the student has been diagnosed and the cognitive style and teaching style of the teacher have been diagnosed, the next process involves putting the appropriate teacher and student together. This leads to the next term for definition.

Matching: the process of determining the most compatible teacher, student, learning materials, and learning environments. This technique is described in Chapter III.

Diagnosis: direct and indirect measures of the defined elements of cognitive style and/or teaching style.

Overview

It has been the purpose in this chapter to present the educational problem of the nursing student who does not complete a program of studies and fails or withdraws. This problem has been considered from the perspective of higher education and more specifically concerned with nursing education. The Oakland Community College, Bloomfield Hills, Michigan, system of using cognitive style as an aid in the "personalization" of instruction was introduced and briefly described since it is used in the experiment in Nursing Education described in subsequent chapters. Consideration has been given to the purpose of this study, its potential in relationship to the identified problem areas, and the terminology to be used throughout the study. A review of the related literature in the next chapter will further

develop the framework for this study and provide the necessary information to discuss the design of the study in Chapter III. The results of the study and an analysis of the data are presented in Chapter IV. In Chapter V the summary, conclusions, and implications for further research are presented.

CHAPTER II

REVIEW OF RELATED LITERATURE

This review of literature deals with three selected areas: higher education, nursing education, and the educational sciences. Each area is considered in relation to the defined purpose of this study and the inter-related questions.

Higher Education

Experimentation creates vitality according to Ralph Tyler. Too often, he states, college seems a required, dull period in which middle-aged adults who have made a mess of the world are trying to make sure the next generation has an equal start. Tyler says the fashioning and use of new inventions to solve critical problems changes the outlook of many students from boredom to exciting effort.¹

Many faculty in higher education have used experimentation within the teaching-learning process to provide interesting variety for students otherwise involved in a dull educational experience. As Hagerman stated in relation to an audio-tutorial approach he is using to teach a science course, "If 50 percent of the university courses

¹Ralph W. Tyler, "We Need the Experimental College," Antioch Notes, XLI, September, 1963, p. 42.

were structured in the same way I have my course structured now, I would change mine so that it would be different."² Hagerman would make a major change every two to three years to maintain the "Hawthorn effect." His major concern is student learning and he channels the energies to helping students learn in a variety of settings.³

Since this study is concerned with the teaching style of instructors and their interactions with students, consideration is given to teachers and teacher behaviors in the learning process. Don Davies, Associate Commissioner for Educational Personnel Development of the Office of Education, reports that teachers are the single most important element in the school; more important than the quality of the facilities, the quantity of the equipment and materials, or the level of financing.⁴ A similar finding is reported by Petro (who reviewed several research reports):

²Personal interview with Dr. Howard Hagerman, Associate Professor, Lyman Briggs College, Michigan State University, East Lansing, Michigan, November 10, 1970.

³Ibid.

⁴Do Teachers Make a Difference? U. S. Government Printing Office, Washington, D. C. 20402 (Document Number 5.258:58042), October 20, 1970.

The artistry of the teacher has such a powerful impact on the quality of the students' learning experiences that differences in procedure, technique, equipment, organization, and method are apparently insignificant.⁵

He claims,

Teachers have to care so much that it hurts; that they are willing to go the extra mile, because you can't inspire students, you can't make them enthusiastic, you can't do a darn thing with the student unless you've got a teacher...you've got to have top-grade teachers.⁶

Petro identified three crucial aspects of the teacher's relationship with his students: 1) his ability to relate to them personally, 2) his ability to teach them, and 3) his attitude toward them. He further describes the crucial aspects:

relate: student-centered approach to teaching, insight, personal flexibility, tendencies to critical self-evaluation, role of listener even counselor, projection of a positive, accepting, and caring attitude.

Important research topics are avoided; such as, the impact of occupational experience of the teacher on the behavior of the student-learner, and the human interaction aspects of the teaching-learning situation.⁷

⁵Peter K. Petro, "The Derivation of Learning Hierarchies and Instructional Objectives in Accounting with Implications for Developing Instructional Systems for Post-High School Programs," Unpublished Doctoral Dissertation, Michigan State University, 1969 as reported by Harold R. Wallace, Review and Synthesis of Research on Cooperative Vocational Education, ERIC Clearinghouse on Vocational and Technical Education, The Center for Vocational and Technical Education, The Ohio State University, 1900 Kenny Road, Columbus, Ohio, p. 69-70.

⁶Ibid., p. 71

⁷Ibid., p. 72.

With the rapid influx of college students and the increased financial pressures to add more students to each faculty member's classes, the situation becomes more complex. Roth sees instructional systems as a means of allowing the teacher to function effectively.

The only line of endeavor currently in sight which provides real hope for the ultimate individualization of education is the development of educational systems based heavily on technologically supported auto-instruction. The programs will be largely self-selected, with defined entry and exit behaviors. They will be branched to provide for a variety of learning styles and modes and...they will be both self pacing and internally rewarding to the learner. In some few cases, with a very dedicated and perceptive teacher, the attempt to individualize may even cause the instructional style to be varied somewhat for different students. ...the learner can select the most comfortable style in which to move through the materials.⁸

Torkelson further supports the position Roth describes as the most legitimate and practical way of allowing the teacher to teach.

The most conservative level of individualization provides optional ways for individuals to learn a prescribed curriculum. The potentials of the new technology for the individualization of instruction are reliable only out of an adequate perception of what is really meant by the new technology and upon a system of instruction which consciously organizes to determine the uniqueness of all means or media of instruction for different kinds of learners and for different kinds of instructional purposes. All forms of media are capable of helping learners to comprehend concepts, to acquire skills and to

⁸Theodore C. Roth, "Expanding the Concept of Individualized Education," The Educational Forum, Volume 36, No. 1, November, 1971, p. 61-62.

shape feelings. Given well-prepared materials, independent of continuous teacher direction, the potential for the teacher to begin to exercise more uniqueness as a counselor, guide, confidant, synthesizer, provaateur, evaluator, creator of unique materials grows in proportion to the availability of those well-prepared materials.⁹

The teaching styles of teachers is referred to although not defined, by Rogers. "There is agreement that effective teaching styles must meet the physical, social, emotional and cognitive needs of individual students. While selecting instructional materials and content is not itself a teaching style, it does reflect the philosophy of the teacher and is a part of the teaching strategy."¹⁰

In spite of the stated need to have instructional materials designed to meet the cognitive styles of students, few materials have been prepared for identified learning styles of students, and there is limited description of how to identify learning styles. Ripple, Millman, and Glock conducted a study designed to determine the relationship between selected characteristics of students (anxiety, compulsivity, exhibitionism, and convergent - minus - divergent thinking style) and the relative success they have in learning from programmed versus conventionally

⁹Gerald M. Torkelson, "Technology: New Goals for Individualization," Educational Leadership, January, 1972, Volume 29, No. 4, p. 315-318.

¹⁰Virginia M. Rogers, "Innovation through Experimentation," Educational Leadership, Volume 29, No. 4, January, 1972, p. 301-304.

structured learning tasks. They found no significant interaction between learner characteristics and the type of learning task (programed, conventional). They used random assignment to the type of learning task with no attempt to match the learner characteristics and the design of the learning materials.¹¹

Perhaps part of the solution lies with the students as Davis proposes, "instructors are not necessarily in the best position to organize an optimum sequence of instruction for students, that what is a 'logical' sequence for the teacher may not be logical for the student."¹² Mager also believes that motivation increases as a function of the amount of control the learner is given over the learning experience.¹³ On the other hand, Fry reports student controlled instruction works very well for some students but not for other students.¹⁴

¹¹Richard E. Ripple, Jason Millman, and Marvin Glock, "Learner Characteristics and Instructional Mode: A Search for Disordinal Interactions," Journal of Educational Psychology, Vol. 60, No. 2, February, 1969, p. 113-120.

¹²Robert H. Davis, Some Psychological Considerations in the Selection and Design of Instructional Models, a paper presented at Joint UNESCO-IAU Research Program in Higher Education Seminar on Methods and Programmes for the Improvement of University Teaching, University of Amsterdam, November, 1970, p. 32.

¹³Robert F. Mager, "On The Sequencing of Instructional Content," In J. P. DeCecco (Ed.), Educational Technology, New York: Holt, Rinehart & Winston, 1964, p. 132-141.

¹⁴J. P. Fry, "The Effect of Student Controlled Instruction on Learning," Unpublished Doctoral Dissertation, Michigan State University, 1970.

It would appear that one of the major problems within higher education involves the harmonious and/or beneficial combination of teacher, learner, and learning activities to achieve specified learning tasks. Within the nursing education setting a similar problem is evident in relation to learning achievement.

Nursing Education

There is at present great concern about teaching effectiveness and ways of measuring the outcomes of learning in nursing education. As a part of the institutions of higher education, the nursing programs are being scrutinized in the same way other educational programs are being examined in terms of student achievement, of course objectives, and failure-success rates. The nature of the learner may be the greatest indicator of the ultimate effectiveness of the teaching-learning process according to Metz and McCleary. They assert an educational program should be commensurate with the intellectual and individual needs of the learner if effective learning is to take place. A nursing student enters the educational program with previously developed learning patterns, a variety of different educational experiences, motivations and attitudinal processes. If the student is to achieve the curriculum requirements, the program must be presented in a way that recognizes the existence of individual differences and is willing and able to adapt to them. Metz and McCleary developed an

instrument to record each student's past learning experiences on an individual basis. The collected information would indicate individual or class experience with term papers, group projects, library research, past reactions to quizzes and examinations, note-taking performance, and selected reading habits. Increased knowledge of the learning characteristics of the student provides the faculty with information that will allow for development of an educational environment which enhances the learning process.¹⁵

How the instructor will use the increased knowledge of the learning characteristics of students is not described. Teachers might begin by identifying the major tasks of the performance to be learned and the behaviors the student is to acquire in order to master the tasks and performance itself, suggests deTornyay.¹⁶ An attempt to assist the learner to achieve the requirements of the learning task should take into account the characteristics of the learner.

Educators in nursing need to consider different educational methods for teaching different aspects of nursing (different learning tasks) as described by Skipper, Wooldridge,

¹⁵Edith A. Metz and Carol M. McCleary, "Knowing the Learner," The Journal of Nursing Education, Vol. 9, No. 1, January, 1970, p. 3-9.

¹⁶Rheba deTornyay, "Instructional Technology," The Journal of Nursing Education, Vol. 9, No. 2, April, 1970, p. 5.

and Leonard in a discussion of the use of behavioral science in nursing education.¹⁷ They suggest there is an inclination in current educational programs to take the findings of behavioral research and try to apply them in nursing situations. Teaching nurses innovative techniques in patient care without teaching them how to achieve acceptance in the bureaucratic hierarchy of the hospital environment can produce frustrated nurses. They have been prepared to practice nursing in a way which is neither encouraged nor rewarded. How to achieve the necessary changes in the hospital organization is an appropriate area for social research and an important area to apply the behavioral sciences to the problem of health. It is not difficult to understand why many nursing education programs have not recognized behavioral research as a part of practice. Instead of placing emphasis on experimentation, inquisitiveness, speculation, and critical thinking, there is a tendency to be rigid and didactic, emphasizing conformity and traditional ways. The students are usually required to fit the mold and may be confronted with failure in the program if they do not meet the expected conformity.¹⁸

¹⁷James Skipper, Powhatan Wooldridge, and Robert Leonard, "The Use and Misuse of Behavioral Science in Nursing Education," The Journal of Nursing Education, Vol. 8, No. 1, January, 1969, p. 25-27.

¹⁸Ibid.

The application of behavioral research in nursing education suggests the faculty included the application of learning theory as described by Brodie. She suggests the application of the classically associated stimulus-response model of learning incorporating reinforcement techniques. The strength of the nursing instructor's reinforcing effect on student learning has recently been studied with scientific rigor. Of particular interest are the possible effects of the teacher's values, attitudes, and more particularly, her beliefs and expectations of the individual students' abilities. Studies have demonstrated that the differences between two groups (identified as earmarked for intellectual growth and the undesignated control group) was in the mind of the teacher. In whatever subtle or overt ways the teachers communicated to the experimental group that they were expected to do well, it did work. Teacher's expectation of their students' performance may serve as a self-fulfilling prophecy.¹⁹ Every nurse educator can recall situations where student performance was influenced by the teacher's expectations.

In spite of many problems and obstacles, nursing educators have sought assistance to improve the teaching-learning process as evidenced by the literature which describes the

¹⁹Barbara Brodie, "Re-examination of Reinforcement in the Learning Process," The Journal of Nursing Education, Vol. 8, No. 2, April, 1969, p. 27-32.

inclusion of research findings in nursing curriculum design and implementation. Wolf examined some implications of short-term, long-term memory theory in an effort to identify the applications to nursing education and nursing practice. Short term memory is described as the working memory used to solve problems and may likely be composed of different short-term memories such as visual, auditory, kinesthetic, and linguistic.²⁰ It would appear that the more sensations going into short-term memory the more resources one would have available to solve problems. It is hypothesized by Davis that the short-term memory stores have a limited capacity (seven plus or minus two pieces of information) for holding information.²¹ If too much information is fed into the short-term memory storage, the first items put in are apt to be lost. Physiologists suggest that as information comes into the organism, "neuronal models" are constructed by the mesencephalon, diencephalon, amygdala, and the frontal lobes, by calling on the information in the long-term memory. Incoming information is continuously monitored to determine if it is similar to or different from the characteristics of the neuronal model.²² If the sensations are different, a series of changes take place which are

²⁰Vivian C. Wolf, "Some Implications of Short-Term, Long-Term Memory Theory," Nursing Forum, Vol. 10, No. 2, 1971, p. 150-165.

²¹Davis, "Psychological Considerations," Op. Cit., p. 30.

²²Wolf, "Short-Term, Long-Term Memory," Op. Cit., p. 154.

called the orienting response or reaction. The orienting response is associated with other measurable changes such as the conductivity of the skin, heart rate, respiratory rate, and the electroencephalographic waves. In analyzing the orienting process, two functions are apparently related to the adequate functioning of the frontal lobes and the amygdala: 1) sampling the input of information, and 2) registering, coding, and anticipating the information. Wolf suggests the control processes that help keep information in the short-term memory can help in holding information long enough for a neuronal model to be constructed. The neuronal model is essential to the processing required to transfer information to the long-term memory which may have its basis in long lasting anatomical or molecular changes. Information may not be simply fed into long-term memory as it comes to the individual; an important part of experiencing may be the recombining of new inputs with prior experience by recall thinking. The nurse educator can use the spacing of information and the employment of many sensory inputs to help code information into several short-term areas, some of which may be more functional than others.²³ The use of multi-sensory learning experiences thus increases the student's potential for learning since many inputs are being used. The study and research of the biochemical aspects of learning and memory appears to hold much potential for educators in

²³Wolf, Op. Cit., p. 164.

all disciplines and at all levels of learning.

The nursing literature has not described procedures whereby a student's individual learning style is determined in order to design specific learning approaches for that student. A number of studies have attempted to identify factors which may predict the nursing student's success both in a program of nursing education and on the state board licensure examinations. Although most of the studies are limited in scope, a few sample investigations are worthy of review.

In considering the problem of nursing student attrition, Mitchell attempted to explore methods which could be effective in reducing the number of nursing student dropouts.

Three intervention approaches were utilized, each dealing with one-third of the experimental group, utilizing counseling, motivational, and tutorial techniques. Although there were no significant differences between the three groups in terms of the grades received, there were differences in the number of dropouts from each group, with the fewest dropping out from the motivation group followed by the tutoring group and finally the counseling group.²⁴

The achievement problem is considered from a somewhat different perspective by Backman and Steindler in an investigation of the relationships of specific admissions criteria to success in the Rutgers associate degree nursing

²⁴Teresa Mitchell, "An Exploratory Study of Selected Variables Related to Attrition in One School of Nursing," Kansas City, Missouri, University of Missouri, 1970, Doctoral Dissertation reported in Nursing Research, Vol. 20, No. 2 March-April, 1970, p. 183.

program and performance on state board examinations. Correlation coefficients were computed between measures of scholastic aptitude and achievement on the one hand and cumulative grade point average at the end of the program and scores on the state boards exams on the other hand. Results showed the Scholastic Aptitude Test (SAT) to have higher correlation with the college GPA ($r = .46$) and the five state board examinations (coefficients ranged from .36 in Pediatric nursing to .50 in Medical nursing) than did the other measures.²⁵

A similar finding is reported by Kovacs in a study of 310 students graduating from three collegiate schools in Pennsylvania where the Verbal and Total SAT scores appeared to be more useful than measures of intelligence and high school rank in predicting success in a baccalaureate nursing program.²⁶

Educational Sciences

The idea of learning sets was developed by Robert Gagné and his associates. Gagné defines learning sets as the capabilities the student has at any given stage in the learning

²⁵Margaret E. Backman and Frances M. Steindler, "Let's Examine: Prediction of Achievement in a Collegiate Nursing Program and Performance on State Board Examinations," Nursing Outlook, Vol. 19, July, 1971, p. 487-489.

²⁶Alberta R. Kovacs, "Predicting Success in Three Selected Collegiate Schools of Nursing," New York, New York, Teachers College, Columbia University, 1968, as reported in Nursing Research, Vol. 20, No. 6, November-December, 1971, p. 547.

of a given task. Although these abilities are internal to the learner, they are directly measurable as performances. It is possible to identify the sets needed to learn a particular task by working backward from the selected task to the prerequisite abilities. The simple and more general abilities form a hierarchy Gagné terms a learning structure.²⁷

DeCecco describes learning styles as personal ways an individual processes information in the act of learning new concepts and principles.²⁸ He discusses two types of learning styles: conceptual tempos and selection strategies. Conceptual tempos are basic inclinations of the individual either to reflect on his solution of a problem or to make an impulsive, unconsidered response. The person with the impulsive, or fast, tempo solves a problem with little delay. The person with the reflective, or slow, tempo considers alternative solutions and consequently presents a slower response. Studies suggest: 1) reflection tends to increase with age, as does accuracy, 2) the tendency to display fast or slow decision times was relatively stable, 3) the tendency toward reflection or impulsivity is evident in carrying out many tasks, 4) the dispositions seem to be linked

²⁷Robert M. Gagné, "The Acquisition of Knowledge," Psychological Review, Vol. 69, 1962, p. 355-365.

²⁸John P. DeCecco, The Psychology of Learning and Instruction: Educational Psychology, Prentice-Hall, Inc, Englewood Cliffs, New Jersey, 1968, p. 75-76.

to some basic personality factors. It is suggested that the teacher should adjust his procedures and the tempo of the teaching to accommodate these two modes of learning. Four selection strategies are described as the ways an individual can learn concepts. In "conservative focusing," the learner uses a known example of the concept as a focus and changes one characteristic of the unknown example at a time to identify the essential characteristics. An example cited which demonstrated "conservative focusing," follows:

The student visits a large furniture store and finds a piece of French Provincial furniture, a chair. Wishing to acquire the concept French Provincial furniture, he uses the first example as his focus and finds another chair similar in every respect but one, its finish. He discovers that this chair is also French Provincial. He then finds a chair in which only the upholstery is different and discovers that this chair is also French Provincial. By selecting different chairs and varying one attribute at a time, the student will eventually discover the essential and non-essential attributes of French Provincial chairs.²⁹

Another strategy is "focus gambling" in which the individual uses a focus example and changes more than one characteristic at a time. In reference to the French Provincial chair he may select one with a higher back, straighter legs, and a different finish. If the salesman tells him he has not selected a French Provincial chair, he does not know which characteristic is wrong. He has gambled and lost. The impulse individual uses focus

²⁹DeCecco, Psychology of Learning, Op. Cit., p. 78.

gambling while the reflective individual uses conservative focusing. The other two selection strategies are described as simultaneous and successive scanning. In simultaneous scanning, the individual formulates one or more hypotheses of what the concept may be and looks for examples. In successive scanning, he tests a single hypotheses at a time. The learner may vary his strategy with the concept or he may keep a particular strategy regardless of the concept to be acquired. DeCecco suggests selection strategies as a means of classifying entering behavior for instructional objectives for the learning of concepts, principles, and problem solving.³⁰

If educators and scholars are to establish mutual understandings of the problems and phenomena in education, a unifying conceptual framework and language are essential. Hill has proposed that a conceptual framework and a scientific language can be developed for the applied field of education.³¹ The conceptual framework which will best serve the purposes of education is one made up of a set of disciplines called the educational sciences which were discussed in Chapter I, designated as: 1) symbols and their meanings, 2) cultural determinants of the meaning of symbols,

³⁰DeCecco, Psychology of Learning, Op. Cit., p. 78-79.

³¹Joseph E. Hill, "The Educational Sciences," Unpublished manuscript, Oakland Community College, 1968.

3) modalities of inference, and 4) cognitive style. For purposes of this study, consideration was given to those investigations which deal most specifically with cognitive style and teaching style.

Wyett conducted a pilot study to analyze cognitive style and teaching style of students to examine the possibilities of using the educational sciences strata as tools of analysis and prediction.³² The purpose was to determine cognitive styles and teaching situations which could produce a "different" approach to assessing particular aspects of teacher preparation and teacher effectiveness in selected teaching situations. He found that those persons in the study who were placed in teaching situations which were not in keeping with their style did not perform as well as those who were appropriately matched; the teaching style of an individual is apparently very strongly influenced by his cognitive style.³³

Using the conceptual framework of the educational sciences, Schroeder studied the cognitive styles of 118 students and their teacher to seek answers to the following questions:

- Do students of cognitive styles considered to be similar to that of the teacher tend to classify her as an 'effective' teacher?
- Do the students with cognitive styles similar to that of the teacher tend to receive higher grades in the subject taught than do those students with a 'disjunct' style?

³²Jerry Lane Wyett, "A Pilot Study to Analyze Cognitive Style and Teaching Style with Reference to Selected Strata of the Defined Educational Sciences," Wayne State University, Detroit, Michigan, Doctoral Dissertation, 1967. p. 15

³³Ibid., p. 101.

Is there a predominance of certain common elements in the cognitive style of those students having cognitive styles determined to be 'similar' to the cognitive style of the teacher?

Is there a predominance of certain common elements in the cognitive style of those students having cognitive styles determined to be 'disjunct' to the cognitive style of the teacher?³⁴

Schroeder found that students rating the teacher high in effectiveness tended to a statistically significant degree (at .05 level) to be students having cognitive styles "similar" to that of the instructor. Students diagnosed as having "similar" cognitive styles also tended to be the students who received the highest grades. The predominant elements found for the "similar" group were: T(VL) and T(AL) in the set of symbols and their meanings; I and Ia in the "cultural determinants" set, and L in the "modalities of inference" set. For the "disjunct" group the elements were minor t(vl) in the set of symbols and their meanings; A in "cultural determinants" and M in the "modalities of inference" set. ³⁵

In order to determine whether a "collective cognitive style" could be established for groups of students receiving different final letter grades in two English courses at

³⁴Arlen V. Schroeder, "A Study of the Relationship Between Student and Teacher Cognitive Styles and Student Derived Teacher Evaluations," Wayne State University, Detroit, Michigan, Doctoral Dissertation, 1969, p. 8.

³⁵Ibid., p. 10.

Oakland Community College, Hoogasian collected data for 472 students. The findings of his study indicated that collective cognitive styles could be identified and related to various letter grades earned by students, however, the data did not serve as definitive predictors of final letter grades; rather, the collective cognitive styles were useful as predictors of success or failure in the courses under study.³⁶

In considering the symbolic conditions of learning tasks, Hill explains the relationship between theoretical symbols and qualitative symbols.³⁷ He explains the relationship in terms of a four-part continuum illustrated by a cylinder shown in Figure 2. The four parts are identified as theoretical predominance (TP), reciprocity (REC),

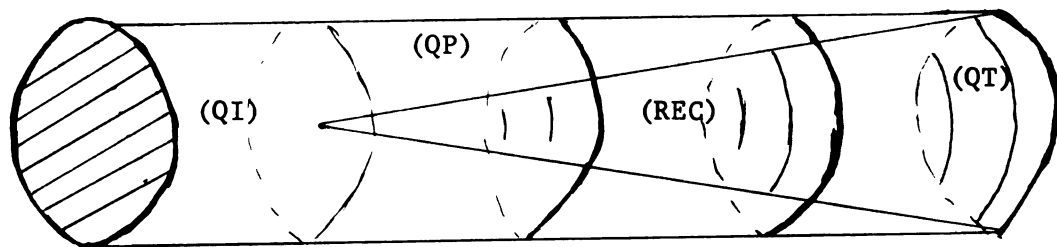


Figure 2.--Continuum of Symbolic Conditions

³⁶Vaughn Hoogasian, "An Examination of Cognitive Style Profiles as Indicators of Performance Associated with a Selected Discipline," Wayne State University, Detroit, Michigan, Doctoral Dissertation, 1970, p. 42-43, 59-85.

³⁷Joseph E. Hill, Symbols and Their Meanings, Oakland Community College, Bloomfield Hills, Michigan, p. 26-29.

qualitative predominance (QP), and qualitative independence (QI). The area labeled (QI) is assumed to be solid and represents a situation in which symbolic use is performed in the domain of the qualitative, e.q., a person who can neither read or write music composing and presenting, by voice or instrument, a music presentation. The next area of the continuum, labeled (QP), includes the solid segment and a hollow cone section. The hollow cone represents the theoretical symbolic which is less in volume in this area than the solid cylindrical segment representing the qualitative symbolic. Qualitative predominance (QP) would exist in a music lesson in which the instructor gives some verbal (theoretical symbolic) instruction; but the major activity is the student's performance which would involve the qualitative symbolic. The condition of reciprocity (REC) occurs in situations where the symbolic use is about equally divided between the theoretical and the qualitative. The section of the continuum labeled (TP) represents the situation where the symbolic condition is predominantly theoretical. Analyzing a learning task in terms of the symbolic conditions would help an educator to determine teaching methods most appropriate for a specific learning task.³⁸

Summary

A review of selected studies in higher education suggests teachers are in a position to use technology as a means of

³⁸Hill, "Symbols," Op. Cit., p. 30.

individualizing instruction and providing increased interaction opportunities between the teacher and student. A review of the nursing literature described the inclusion of biological, social, and psychological research in the planning and implementation of teaching-learning requirements in nursing education. The idea of learning sets described by Gagné was reviewed as an introduction to the conceptual framework of the educational sciences. Selected studies in the educational sciences indicate students having cognitive styles similar to their instructor tend to rate the instructor high in effectiveness and tend to receive the highest grades. In concluding, the area relative to the educational sciences, a brief survey of the symbolic conditions of learning tasks is presented.

CHAPTER III

DESIGN OF THE STUDY

Introduction

This study involves the students and faculty of the associate degree, registered nurse, nursing education program at Delta College, University Center, Michigan. The college is a two-year community college with offerings in technical, vocational, and transfer programs. Financial support is provided by tax levy in the three surrounding counties (Bay, Saginaw, and Midland), state appropriations, and student tuition. There are approximately 5,000 full-time day students enrolled in the college and another 5,000 part-time evening students. There are 178 full-time faculty members, most of whom have a Master's Degree in their subject discipline, with approximately 10 faculty holding a Ph.D. Degree. The college provides several community service activities and frequently is the location for professional, business, and service organizations workshops and meetings. The college is one of the original members of the League for Innovation and enjoys a climate conducive to innovation in teaching-learning approaches. The League for Innovation in the Community College is a national organization of 15 junior college districts that aims, through cooperative work, to encourage and evaluate innovation and experimentation

designed to improve all aspects of college operation. Membership includes 41 junior colleges with an enrollment of more than 300,000 students and more than 10,000 faculty members. The League proposes to accomplish its aims by cooperative work between and among its members. Such cooperation will assist them to:

- 1) experiment in teaching, learning, guidance, and other aspects of junior college operation
- 2) share the results of their experiments
- 3) share ideas on planning and learning objectives
- 4) exchange instructional materials and procedures designed to enhance learning
- 5) examine the relevance of varied modes of college administration to experimentation in teaching and learning
- 6) provide a common base for research on the effects of various innovative practices by gathering and sharing data on students, programs, and modes of organization
- 7) evaluate the impact of the institution's practices on its students and community.

The League is supported by membership fees and by other contributions (including staff time, facilities and funds) by its members, by foundation grants, and by government and other contracts.

An office of institutional research at Delta College further supports innovative approaches to the institutional objectives. An experienced counseling staff provides counseling, guidance and related student services. A 360-40 computer is used for registration, test correction services,

record keeping, payroll, as well as course offerings in data processing and computer programming. The computer is available for statistical analysis of data and evaluation services.

Delta College serves the tri-county area of Bay, Midland, and Saginaw, with a combined population of over 450,000. The area is a combination of farming and diversified industry. Among the industries represented in the area are: Dow Chemical, Dow Corning, General Motors, Defoe Shipbuilding, and Wickes Corporation. Saginaw has a relatively large black population with social and community problems resulting from segregation by way of housing and school systems. There has been an attempt to recruit and support a representative sampling of the black community into the college by way of scholarship offerings and selected special programs for the black students; namely, Black History and Language offerings along with special tutoring services. The college is located in Bay County in a rural area approximately equi-distant from the three cities. Most students drive their own cars to the college or join in a car pool, since public transportation to the college is extremely limited or absent on a consistent basis. Limited dormitory facilities are available on the campus and in connection with one of the area hospitals. Nursing students have clinical experiences in nine to ten of the area hospitals in Saginaw and Bay City. Students are assigned to a single hospital

for a semester and are expected to provide their own transportation to the clinical facility.

Delta College is an "open-door" college where all high school graduates or those with equivalency diplomas are admissible to the college. The counseling staff advises each student to enroll in a course of study appropriate to the individual student's learning needs and goals. The student retains the option to enroll in any course of study and may disregard counseling advice. The college gives the student the right to attempt any course of study he selects. For the most part, all students are eligible to enroll in any course of study on a first-come, first-serve basis. These policies apply to the nursing curriculum at the present time. A grade point of 2.0 is required to be in good standing and to graduate.

Sample

Students for this study include all the men and women ranging from 17 to 67 years of age enrolled in the second nursing course at Delta College, University Center, Michigan. Approximately 45 students enroll in the spring term, and 210 in the fall term for a total of approximately 255 in the first nursing course. The students enrolled in the first nursing course have been counseled by the college counseling staff and are eligible to enroll in the first nursing course on a first-come basis. The students who complete the first course with a final grade of D or above

are eligible to enroll in the second nursing course.

Students enrolled in this program can be expected to

- 1) be high school graduates, or the equivalent thereof,
- 2) have taken standard college entrance examinations,
- 3) have had a curriculum counseling session with a member of the Delta College counseling staff. It could also be expected that of the students in the nursing program,

- 1) nearly 50 percent are less than 25 years of age,
- 2) approximately 90 percent are female, 3) approximately 50 percent are single, 4) over 50 percent are employed 10 hours or more in addition to their course of studies, 5) approximately 70 percent live at home and commute daily to classes and clinical laboratory.

Faculty for the study include all faculty (full-time and part-time) who are teaching students in the clinical laboratory for the second nursing course. Faculty are organized in a team to assist students more effectively. There are two major tools that facilitate effective team activity: 1) a basic written plan* of action for each type of learning experience, and 2) one or more weekly planning sessions. The basic written plan is treated as a working tool to be used, revised and/or improved to keep student learning needs in focus. Planning sessions concentrate on the teaching techniques to be used in the sessions each

*The plan includes behavioral objectives for each session and a plan to meet each objective. The written plan is contained in a course workbook, SEARCH, published each term for each course; revisions are implemented each term.

week, the items to be included in the quiz session that week, and the revisions to be implemented to improve student achievement. The lead instructor coordinates learning activities with faculty team members and participating clinical facilities, develops course content, and assists faculty and students in the teaching-learning process. All faculty in a single course use the same learning materials and objectives for each of the learning sessions.¹

For the orientation to this study, students and faculty were provided with a written and oral explanation of the purpose of the study and the expected participation. All 12 faculty agreed to participate in the study and all 33 faculty agreed to cognitive style diagnosis. All second course students participated either as a part of the matched or the non-matched group.

Measures

The measuring devices used in this study included: 1) cognitive style testing, 2) identification of teaching style, 3) faculty interviews, 4) test scores and final course grades, 5) student evaluation of faculty, and 6) teacher rating scales of cognitive style. Each of these measuring

¹Crystal M. Lange, Autotutorial Techniques in Nursing Education, Prentice-Hall Publishing Company, Inc., Englewood Cliffs, New Jersey, 1972, p. 40-51.

devices will be described as used within this study.

Cognitive style testing procedures developed at Oakland Community College by Fragale, Svagr, and Zussman (with established reliability and validity), were used for each student and faculty. The testing procedures include 10 separate testing devices including reading, auditory, olfactory, visual, tactile, and savory components. The testing instruments include vehicles to determine the theoretical, qualitative, and perceptive abilities of the individuals as well as the cultural determinants and modalities of inference. The battery of cognitive style tests has been administered to several thousand entering freshman students at Oakland Community College (to date the number is well over 20,000 students).

The elements of cognitive style were introduced in Chapter I and considered in the related literature of the "educational sciences" in Chapter II. The following instruments as developed by Fragale, Svagr, and Zussman, were used to identify cognitive style elements as part of this study.

Test 1. [T (VL) or t (vl)* Theoretical Verbal Linguistic]
Verbal Reasoning Test

This test is made up of 25 sentences in which the first and last words are omitted. The student is asked to select the words which would complete the blank spaces in such a way that the sentence would be true and sensible. The student has a choice of five pairs of words to fill the

*See Chapter I for the explanation of major and minor scoring.

blank portions of each sentence. The first word of the selected pair fills the space at the beginning of the sentence, and the second word fills the space at the end of the sentence. This test has a time limit of 15 minutes. The following is a sample item:

..... is to masculine as woman is to

- A. man.....madame
- B. malicious.....feminine
- C. malicious.....girl
- D. man.....feminine
- E. man.....girl

Test 2. [T (AL) or t (al) Theoretical Auditory Linguistic]
Listening Comprehension Test

This test consists of a brief account of the food-gathering behavior of a south sea island people. A tape recorder is used to present the information to the students, explaining how a coconut is removed from the tree for food. After listening to the audio tape recording, the student is asked selected questions to determine his understanding of the account.

Test 3. [T (VQ) or t (vq) Theoretical Visual Quantitative]
Visual Numerical Test

In this test, 20 numerical problems are presented which include addition, subtraction, multiplication, division, square roots, percentages, fractions, ratios, cube roots, and discounts. The student is given five choices with the fifth to be used when no correct answer is included in the

first four choices. The student is given scratch paper and has 15 minutes to complete the items. A sample item in this test follows:

$$\begin{array}{r} \text{Multiply } 2.04 \\ \underline{.75} \end{array}$$

- A. 1.5300
- B. 153.0
- C. 1530
- D. 15300
- E. none of these

Test 4. [T(VL) or t(vl) Theoretical Verbal Linguistic]

Reading Test

The student has 36 short paragraphs to read. At the end of each paragraph a question is presented to be answered in one word. There are four choices for each question.

The time allotment is six minutes. One of the items follows:

Switzerland has little land and few people.
The Swiss people work hard, however, and their
country is clean and prosperous. Switzerland is

- A. large B. small C. dirty D. poor

Test 5. [T(AQ) or t(aq) Theoretical Auditory Quantitative]

Oral Numerical Test

This test contains 10 numerical word problems, including addition, subtraction, multiplication, division, fractions, percentages, and word problems. The content is presented by means of an audio tape recording or oral presentation. The student writes only the answer. A sample problem follows:

A newsman collected 25¢ from each of six customers.
What is the total amount he collected?

Test 6. [T(VL) or t(vl) Theoretical Visual Linguistic]
Grammar Test

Each of 30 sentences is divided into four parts lettered A, B, C, and D. The student is to decide which part, if any, contains an error in grammar, punctuation, or spelling. Then he indicates the letter corresponding to the part of the sentence which is in error. Some of the sentences are error-free. The letter E is provided as an answer to indicate "no error." No more than one error occurs in each sentence. There is a time limit of 25 minutes. The following is an example:

He knew / he done / as well as / anybody else.

A

B

C

D

E

Test 7. Qualitative Codes Test

This test is made up of 40 questions regarding the student's interests, actions, attitudes, capabilities, conduct, beliefs, values and other aspects of personal behavior. The student is to rate each item with regard to how the item is like him. Four possible responses are provided: usually, sometimes, seldom, and never. This test is not timed, but the student is urged to work quickly and to give the first answer that comes to mind. It is emphasized that the student record his first impression. An example of an item is:

I influence others to join me in a cause.

A. usually B. sometimes C. seldom D. never

Tests 8 and 9. Test of Cultural Effects

Ten stories or situations which may have happened to people are presented. The student must make a decision about how he would respond or react (in real life) if he were required to choose among the possible reactions: the one that is "most like him" and the one that is "least like him." The student must make these two choices and leave one blank. No time limit is required for this test. A sample item is:

Don Roberts needs a car to get to his new job. He goes to the used car agency with some of his buddies and his Dad. His father wants him to buy one car, his buddies are urging him to buy a different one and he has been thinking about another one. He should:

10. Buy what his father suggests
A) MOST B) LEAST
11. Buy what he has been thinking about
A) MOST B) LEAST
12. Buy what his buddies are telling him to get
A) MOST B) LEAST

Test 10. Test for Inferential Patterns

Ten situations are described in which the student is asked to imagine he is involved. Each situation has four possible responses. The student is asked to decide which response he would "most likely" make as the first choice or best solution, then second best, third best, and fourth best. The student is required to rank all four responses for each situation in the order of his "most likely" response even though he does not like some of the offered responses.

The following is a sample item:

If you were asked to recommend a "very good" restaurant to your best friend's family, what would you most likely do:

1. Determine if the restaurant has the high standards of very good restaurants you have visited in the past.
 - a. first choice
 - b. second choice
 - c. third choice
 - d. fourth choice
2. Find out if its standards are in keeping with older traditions as well as modern ones, and the extent to which it is like or different from other good restaurants and eating places.
 - a. first choice
 - b. second choice
 - c. third choice
 - d. fourth choice
3. Discover in what ways the restaurant resembles and duplicates other fine eating places.
 - a. first choice
 - b. second choice
 - c. third choice
 - d. fourth choice
4. Determine in what ways the restaurant's reputation is different from currently accepted standards of excellence.
 - a. first choice
 - b. second choice
 - c. third choice
 - d. fourth choice

The instruments described above make up the major part of the Cognitive Style Test Battery used by Oakland Community College, Bloomfield Hills, Michigan. The testing materials and staff were brought to the Delta College Campus to complete the diagnostic testing of the faculty and students involved in this study. The Cognitive Style computer program of Oakland Community College was used to print out the test results in a Cognitive Style Map. A map made up of the three sets might appear as follows:

$$g = \begin{Bmatrix} T(AL) & t(aq) & T(VL) & t(aq) \\ Q(CEM) & " & " & " \\ Q(CH) & " & " & " \\ Q(CP) & " & " & " \\ Q(CES) & " & " & " \\ Q(CK) & " & " & " \\ Q(CS) & " & " & " \\ Q(CET) & " & " & " \\ q(ckh) & " & " & " \\ q(ct) & " & " & " \end{Bmatrix} \times \begin{Bmatrix} A & I \\ f \end{Bmatrix} \times \begin{Bmatrix} R \\ D & L \\ m \end{Bmatrix}$$

Identification of Teaching Style was accomplished through the combined input of faculty and students. A form was prepared (See Appendix A) which briefly describes the makeup of teaching styles or demeanors as outlined in Chapter I. Teachers may possess major and/or minor demeanors drawn from the following:

- P- Predominant - consistently employing a fixed style of teaching, either authoritarian or permissive.
- B- Flexible - uses a style that appears to be best for each individual student.
- S- Switcher or Adjustive - begins on the basis of the student's style and switching him to the teacher's preferred style.

It is understood that teachers would not demonstrate one particular style to the exclusion of the others, therefore individuals are usually combinations of two styles (i.e., Predominant - switcher, Switcher - flexible).

A group discussion concerning teaching styles was held with the faculty group as a part of an inservice education program. Each faculty member was asked to identify his teaching style as he perceived it and record it on the form. In addition each faculty member was asked to identify a student presently in his group who appeared most compatible with his teaching style and a student who appeared least compatible with his teaching style.

A student version of the "Identification of Teaching Style" was prepared (See Appendix A) and discussed in each clinical group of 15 students. Students had an opportunity to read the description and to ask for clarification on any aspect of teaching style. The instructor whose style was being identified was not present during this discussion period. Students were asked to rate the teaching style of their present instructor and record it on the form. In addition each student was asked to indicate the teaching style he thought he would prefer for his next nursing course. There was also provision for comments the student would like to offer regarding any personal preferences for the next course. The students' identification of teaching style and the faculty's identification of teaching style were tallied. Most faculty received 15 student ratings plus their own rating. The teaching style was determined by the combined ratings. If an element (i.e., B - Flexible) was identified by 50 percent and over of the raters, the element was

registered as a major. If it was identified by 25 to 49 percent of the raters, the element was designated as a minor. An element which received less than 24 percent of the ratings was considered negligible and not included as a part of the instructor's teaching style. For example, one instructor received the following ratings from 15 students:

<u>Element</u>	<u>Number</u>	<u>Designation</u>
P - Predominant	10	= Major
B - Flexible	8	= Major
S - Switcher	3	= Negligible

This instructor indicated her teaching style as she perceived it was P - (Predominant) B - (Flexible). A summary of teaching styles for the nursing faculty is available in Appendix A.

Faculty Interviews were conducted with each of the faculty teaching the second nursing course. Students in this study had been assigned to faculty on the basis of cognitive style maps and preferred teaching style for the matched group and a number of non-matched students (the techniques for matching will be discussed at a later point in this chapter). Shortly after the semester was underway (approximately four weeks) interviews were held with each instructor regarding specific observations of each student's behavior. In the course of the interview the instructor was asked to respond to the following general items:

1. Briefly describe your general reactions to this student.
2. Describe a behavior you have observed that would be an example of each of the cognitive style elements.
3. What are the student's strengths and weaknesses as you perceive them in terms of success in nursing?

The interviews involved 13 faculty regarding 195 students. The length of interviews varied from a minimum of three hours to a maximum of six hours in divided sessions of one to two hours each. Instructor's statements were recorded for later analysis. At the conclusion of the interview session the individual student's cognitive style maps were reviewed and discussed in relationship to the instructor's observations.

"General reactions to this student" usually provided basic data about the student such as age, marital status, personal problems, and work load. Other comments included some clues as to the way in which the instructor perceived the student, such as:

"She sees herself as a failure who will fail again."

"I spend a lot of time with this student, and she has difficulty applying what she has learned."

"She has an outgoing personality."

"She is a very tiny lady with tiny feelings about herself."

"I don't know her too well; she is a quiet one."

"I'm really fond of this student. She has a fine feeling for the patient."

"She holds herself real tight."

"I don't know if she really wants to be in nursing."

"Describing Behaviors:" Each element of the cognitive style map was briefly explained as the first seven instructors used "A Brief Guide to Cognitive Style Mapping: Symbols and Their Meanings,"¹ as a guide. The instructor was asked to describe a student behavior in terms of nursing care activities that would serve as an example of the presence or absence of the particular element. Instructors were able to identify a large range of behaviors for each of the cognitive style elements. A sample of described behaviors included:

T(VL) "She has trouble understanding what she reads."

"She looks up everything; she does excellent preparation."

T(AL) "She asks for repetition a lot and must look at you when you talk."

"She can follow my spoken directions very well."

"She listens to patients attentively."

"She doesn't use medical terminology often."

"He would rather have you tell him about something than to read it."

T(AQ) "She has no trouble with numbers."

"He is always ahead of the group in figuring out drug dosages from information I tell the group."

T(VQ) "She has to write the formula down each time."

"She does all right if the order is written on the kardex as to the dosage."

¹Joseph E. Hill and Derek N. Nunney, "Personalizing Educational Programs Utilizing Cognitive Style Mapping...", Oakland Community College, February, 1971.

- Q(CES) "The patient's environment was left in a mess."
 "She is very neat and tidy and conscious of how things look in the patient area."
- Q(CET) "She has definite ideas about quality of nursing and wants others to meet her standards."
 "She tries to get by with as little as possible."
- Q(CH) "She is too self conscious to role play but gives it a try."
 "She enjoys playing a role when it is a 'good' part."
 "When asked to role play she gets 'giggly.'"
 "She can control her behavior to produce a desired impression."

The described behaviors were summarized in written form as a preliminary rating scale for the last six faculty to use as guides during their interviews. The pre-testing of the rating scale in the interview sessions were recorded and items revised for clarification. Additional sample behaviors were suggested during the later interview sessions and incorporated in the revised scale.

"Strengths and weaknesses" were discussed in terms of the present course and the probability of success in the next course. Possible approaches to specific behaviors were discussed. Some of the comments included:

- "She lacks initiative and doesn't communicate."
 "She is able to work quickly and think about two to three things at one time."
 "She takes a long time to come to decisions."
 "This person will make a positive contribution to the profession."

"She has difficulty setting priorities."

"This person is not able to function in a leadership role."

These types of comments provided additional perspective for the understanding of cognitive style elements in the nursing setting.

Pre-testing of the developed teacher rating scale was achieved by three faculty not involved in the interviewing process. These three faculty used the scale to rate 21 selected students. Each of the three faculty was given a copy of the rating scale and score cards to tally their ratings for the selected students. A copy of the developed instrument, "Teacher's Rating Scale, Students of Nursing," is available in Appendix B.

Test Scores and Final Course Grades

Test Scores: The cognitive style elements required for the student to use a particular mode of instruction were identified for one sequence in the second nursing course. A group of the five most experienced* nursing faculty at Delta College formed a panel to determine what cognitive style elements a student would need in order to achieve the objectives for a selected lesson segment using one of three methods: 1) audio tape recording in the autotutorial

*These faculty members had taught a minimum of five years at Delta College, had at least five years clinical experience, were full-time, and expressed interest in participating in this function.

laboratory,² 2) small group discussions with a student leader, and 3) read only. These three particular modes of instruction were selected as representative of two relatively traditional methods of instruction and a distinctly technological method. The limitations of time and materials within the scope of this study restricted the inclusion of several possible modes of instruction as provided in Educational Sciences at Oakland Community College. The "read only" represents the usual type of student information source, namely, printed materials. The small group discussion is unique primarily in the sense that it is student-lead with the authority figure of the instructor removed to provide a relatively relaxed student interaction process. The autotutorial mode of instruction is a sophisticated application of educational technology where the student uses a variety of equipment including an audio tape playback, slide projector, moving picture projector, a variety of real objects, as well as printed materials.

Since the usual mode of instruction in the Delta College nursing program is the autotutorial method, the lesson materials were developed and pre-tested for the "small group discussion" group and the "read only" group.

²Crystal M. Lange, Autotutorial Techniques in Nursing Education, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1972, p. 18-19.

Each student was assigned to one of the instructional modes according to the specified cognitive style elements.³ The identified major elements for each of these modes were:

- 1) Audio tape recording in the autotutorial laboratory

$$g = \begin{Bmatrix} T(AL) & T(VL) \\ Q(CS) \\ Q(CET) \end{Bmatrix} \times \begin{Bmatrix} I \end{Bmatrix} \times \begin{Bmatrix} M \\ R \end{Bmatrix}$$

- 2) Small group discussion with a student leader

$$g = \begin{Bmatrix} T(AL) \\ Q(CEM) \\ Q(CT) \end{Bmatrix} \times \begin{Bmatrix} A \end{Bmatrix} \times \begin{Bmatrix} R \\ M \end{Bmatrix}$$

The student leaders for the small group discussions required the following major elements:

$$g = \begin{Bmatrix} T(VL) \\ Q(CET) \\ Q(CT) \end{Bmatrix} \times \begin{Bmatrix} A \end{Bmatrix} \times \begin{Bmatrix} M \\ D \\ R \end{Bmatrix} \text{ match with small group}$$

- 3) Read only students should have the following major elements

$$g = \begin{Bmatrix} T(VL) \\ Q(CET) \\ Q(CS) \\ Q(CEM) \end{Bmatrix} \times \begin{Bmatrix} I \end{Bmatrix} \times \begin{Bmatrix} M \\ R \end{Bmatrix}$$

In describing the modes indicated for each of the instructional modes, the student assigned to the autotutorial laboratory would need a major in theoretical auditory linguistic (the ability to get meaning from the spoken word),

³These elements are in agreement with those identified by Charles M. Wynn and associates for similar modes of instruction in the "Physical Science BURST-Fall, 1970," Oakland Community College, Orchard Ridge Campus, Farmington, Michigan, Personal letter dated February 9, 1972.

a major in qualitative code synoetic (the ability to know one's own strengths and weaknesses), a major qualitative code ethic (the ability to adhere to a set of principles), and a major in theoretical verbal linguistic (the ability to get meaning from the written word). In addition he would have a major I (individualistic), and have an inferential pattern which relies on definitions and rules (M) magnitudes, and (R) relationships (looking for the similarities in a situation).

The student assigned to the small group session would also have a major in theoretical auditory linguistic, but would need a major in qualitative code empathetic (Q(CEM)) and a major in qualitative code transactional Q(CT) (the ability to convince others to go in your way), a major associates orientation (A), and an inferential pattern using (R) relationships and (M) magnitudes similar to the student assigned the autotutorial instruction.

The student who is assigned to the read only method, would require a major theoretical verbal linguistic (T(VL)), a major code ethic, and a major qualitative code synoetic, as well as a major in code empathetic. In addition he would need to be a major independent (I), and use the inferential pattern Magnitudes as well as the R (relationships).

At the conclusion of the lesson by cognitive style assignment, all students took a computer corrected, 20 item test. This test had been prepared and pre-tested in the prior semester and was determined to be reliable and valid

according to item analysis. The student scores on this test were compared with the scores each student had achieved on similar tests that same semester.

Final Course Grades were available on the basis of a percent score for the overall performance as well as clinical performance and written tests and papers. The final course grade sheets indicate students who withdrew from a course after the drop-add period of registration. Each instructor determines the percentage score for his students in relation to the specified course and unit behavioral objectives. For purposes of this study the established evaluation techniques for clinical and classroom performance were in no way altered from the instructor's usual methods. A comparison of final course grades achieved by matched students and non-matched students was possible.

Nursing Student Survey

For the past several semesters this investigator has administered a survey instrument to students completing a nursing course. The instrument has been repeatedly revised following each administration and in accordance with faculty and student responses, as well as continued analysis of the resulting data. For purposes of this study the developed survey instrument was further revised to include cognitive style elements. The prepared instrument was pre-tested with both nursing and non-nursing students and a faculty sample during the semester prior to the actual survey. The pre-testing provided input for refinements and clarifications

and re-testing before the final instrument was administered. Two forms were developed, one for on-campus administration and one for mailing. The form used with students on campus at the end of the course (after final grades had been completed) used a computer answer sheet. The other form was mailed to off-campus students (most of whom had withdrawn prior to the survey) with provision for circling a response. The mailed surveys included a postage paid, addressed, return envelope. Samples of the two Nursing Student Survey forms are found in Appendix C.

Nursing Faculty Survey

A 20 item faculty survey was prepared to determine the ways each faculty perceived his particular group of students and how he regarded cognitive style matching techniques. The developed instrument was pre-tested with a small group of faculty not involved in the study group. The pre-testing provided some revisions for clarification. At the end of the course each participating instructor completed a faculty survey form. A copy of the faculty survey form is available in Appendix D.

Design

The research design employed in this study is a modified post-evaluation only control group design, identified by Campbell and Stanley as a true experimental design.⁴

⁴Donald Campbell and Julian Stanley, "Experimental and Quasi-Experimental Designs for Research on Teaching," in Gage, N.L., Handbook on Research on Teaching, Chicago: Rand McNally and Company, 1963.

Students in the beginning class in the nursing program were diagnosed as to cognitive style and preferred teaching style early in the first nursing course. Each faculty member was diagnosed as to cognitive style and teaching style. Students were randomly assigned to faculty members in the first nursing course according to the usual registration procedures. During the first term the matching of student cognitive style and preferred teaching style with faculty cognitive style and teaching style was prepared for assignment to the matched group in the second nursing course. Students who for any reason did not wish to accept the assignment by matching could select a teacher on their own and became part of a non-matched group.

Final course evaluations served as the criterion for the matched group and the non-matched group in relation to reduction of withdrawal or failing grades in the nursing course. The final course evaluations derived from the second nursing course were compared with baseline data for students in the same course for the prior three years. The baseline data is summarized in Appendix G. Since entry into the second nursing course is based on successful achievement of the defined objectives in the first nursing course, there is a common base of knowledge for students entering the second nursing course. Inasmuch as the second nursing course has two teams of faculty, it was possible to have two matched (experimental) and two non-matched (control) groups. The

	Group I		Group II	
	Cognitive Style Testing Preferred Teaching Style Indicated		Cognitive Style Testing Preferred Teaching Style Indicated	
pre-treatment	Matched* (Experimental)	Non-matched (Control)	Matched* (Experimental)	Non-matched (Control)
treatment				
post-treatment	End of Course Evaluations	End of Course Evaluations	End of Course Evaluations	End of Course Evaluations

*Matching according to student's cognitive style and preferred teaching style and faculty's cognitive style and teaching style.

Figure 3.--Research Design

design is presented in Figure 3.

The initial assignment of students to Group I and Group II was done by considering each student's stated preference for hospital assignment. The hospitals used by Group I are all located in the city of Saginaw. The hospitals used by Group II included one Saginaw and two Bay City hospitals. Following the assignment to Group I and Group II, each student was assigned to a matched (experimental) or non-matched (control) group. Each hospital group (clinical laboratory) had a capacity of 15 students for each clinical instructor. The assignment of instructors to three sections was not finalized prior to the start of the course. Consequently it was not possible to match students to instructor and those three sections were non-matched only.

Matching of student's cognitive style and preferred teaching style to an instructor's cognitive style and teaching style was accomplished in the following steps:

- 1) A major orientation in each of the cognitive style elements of the instructor was selected by a panel of five nursing* faculty as the matching elements. The instructor's cognitive style map was examined for the selection of a theoretical and qualitative orientation, cultural determinants, and modalities of inference. An example of such elements identified from one instructor's cognitive style map was as follows:

$$g = \left\{ \begin{array}{c} T(VL) \\ Q(CEM) \end{array} \right\} \times \left\{ \begin{array}{c} I \\ \\ \end{array} \right\} \times \left\{ \begin{array}{c} R \\ d \\ m \end{array} \right\}$$

*The panel was described earlier in this chapter.

- 2) The identified teaching style as described earlier was added to the cognitive style elements.
- 3) A point value was attached to each of the cognitive style elements and the teaching style as indicated below.

$$g = \begin{matrix} T(VL) [2] \\ Q(CEM) [2] \end{matrix} \times \begin{matrix} I [2] \\ d [2] \end{matrix} \times \begin{matrix} R [2] \\ m [2] \end{matrix}$$

$$ts = \begin{matrix} P [2] \\ b [2] \end{matrix}$$

Total points = 16

- 4) The cognitive style maps of students were reviewed to identify students who had the identified elements in their style and a preference for the indicated teaching style. For each element in the students' map, points were assigned in the manner indicated above, except in the case where the student had a minor element as compared to a major for the instructor (or the student had a major as compared to a minor for the instructor) only one point was assigned. For example the following shows points assigned a student map as compared to the sample instructor.

<u>Instructor</u>	<u>Student</u>
Total Points = 16	Total Points = 12
T(VL) [2]	T(VL) [2]
Q(CEM) [2]	q(cem) [1]
I [2]	I [2]
R [2]	r [1]
d [2]	D [1]
m [2]	M [1]
ts = $\begin{matrix} P [2] \\ b [2] \end{matrix}$	ts = $\begin{matrix} P [2] \\ b [2] \end{matrix}$

- 5) A match of at least 80 percent on the identified elements was required to be considered a matched student. If the instructor's elements were 16 points, each matched student would have at least 10 or more "matching" points. The majority of the matches were 90 percent or higher.

The described matching techniques was performed for over 225 students and the 12 faculty involved in the study. When the section assignments were completed based on the described matching procedures, each student was notified of his assignment approximately six weeks before the start of the semester. Each student had been involved in the cognitive style diagnostic tests, discussion sessions regarding their own cognitive style map, the purpose of the study and the identification of teaching style. Following the assignment by matching, students had the option to request another section or instructor. Of the matched students over 50 students requested transfer to another section for a variety of personal reasons. The "Request for Change in Nursing Section" and selected reasons for transfer are in Appendix E. Regardless of the reasons given, each request for transfer was implemented. Each of the clinical groups contained matched and non-matched students since the transfers became a part of the non-matched group. The groups of matched and non-matched students are summarized below:

Group I

Instructor	Matched	Non-matched
1	7	6
2	9	6
3	-	15
4	5	7
5*	-	14
	21	48

Group II

Instructor	Matched	Non-matched
6	7	6
7	5	10
8*	5	8
9*	-	14
10	4	9
	21	47

The instructors were not aware of which students had been "matched" and which were "non-matched" (except the three instructors who had all "non-matched" students). The instructors' final course evaluation was not influenced by the knowledge of "matched" and "non-matched" students in each group.

Prior to the start of this study, in early fall, the total faculty group (33) had participated in cognitive

*part-time faculty.

style diagnosis followed by an eight hour workshop conducted by Dr. Joseph E. Hill and Dr. Virginia Svagr relative to the Educational Sciences and cognitive style. During the workshop each faculty member reviewed his own cognitive style map as the specific elements were being discussed. A summary of the research design indicates each of the phases and approximate sequencing.

<u>Phase</u>	<u>Description</u>
1	Diagnosis of Faculty Cognitive Styles
2	Faculty Workshop and Orientation
3	Diagnosis of Students' Cognitive Styles
4	Student Orientation Sessions
5	Identification of Teaching Style and Preferred Teaching Style
6	Match Students Cognitive Style and Preferred Teaching Style with Faculty Cognitive Style and Teaching Style: Assign to a Nursing Section
7	Transfer Students as Requested
8	Conduct Faculty Interviews Relative to Student Behaviors and Cognitive Style Elements
9	Administer Nursing Student Survey Forms - End of Course
10	End of Course Grades
11	Administer Nursing Faculty Survey Form

Hypothesis Generating Activities

In addition to the research design described above, selected "hypothesis generating" activities were pursued as a part of this study. The cognitive style requirements of

a lesson segment, described earlier, were identified by a panel of five nursing faculty. The content selected was predominately theoretical concepts dealing with disturbances in excretion and/or retention. The usual instructional mode at Delta College for such material is by means of an audio tape recording in the autotutorial laboratory. The panel identified cognitive style elements required for a student to achieve the content in one of three modes:

1) audio tape recording in the autotutorial laboratory, 2) small group discussion with a student leader, and 3) read only. The necessary elements for these three modes were discussed earlier in this chapter and are found on page 73.

For the purposes of this study each student in Group I and Group II were assigned to one of the instructional modes according to the numerical cognitive style matching process as described under "matching." The required materials were prepared for the "read only" group as well as a discussion guide for the student leaders in the small group discussions. An orientation session of one hour was provided for each of the student leaders prior to their discussion groups. Following the completion of the designed instructional experience, a test was administered by each instructor in the regular quiz session. The usual computer answer sheets were used and a reaction sheet was provided for students to indicate their responses to the lesson

format. The quiz scores on this unit were compared with each student's composite quiz scores on similar units of study throughout the semester. A copy of the quiz and reaction sheet is contained in Appendix F.

Re-testing of Cognitive Style was conducted on a selected sample of students near the conclusion of this study. The sample had been diagnosed for cognitive style during the spring semester prior to the conduct of this study (almost one year previous to the second testing). The purpose was to identify changes which may have taken place in the total cognitive style and to pose hypothesis relative to the presence or absence of changes in cognitive style. The diagnostic testing team from Oakland Community College re-administered the complete testing materials to these students during an eight hour session. Results and comparisons of the diagnostic testing were shared with individual students on a one-to-one basis.

The Teachers Rating Scale: Students of Nursing was used to identify cognitive style elements of this same group of students. The faculty who rated the students had not been directly associated with the study except as they participated in the general nursing faculty workshops. The results of these "hypotheses generating" activities are reported in Chapter IV and Chapter V.

Testable Hypothesis

To determine the effect of matching the students' cognitive style and preferred teaching style with the instructors' cognitive style and teaching style, statistical hypotheses were generated and tested. Each null hypothesis tested is presented followed by an accompanying alternate hypothesis.

Null Hypothesis: When students' cognitive style and preferred teaching style is matched with the instructors' cognitive style and teaching style, the frequency of failure-withdrawal in that course will not be less than the failure-withdrawal rate for non-matched students.

Alternate Hypothesis: When students' cognitive style and preferred teaching style is matched with the instructors' cognitive style and teaching style, the frequency of failure-withdrawal in that nursing course will be less than the failure-withdrawal rate for non-matched students.

In this study the matching of students' cognitive style and preferred teaching style with the instructors' cognitive style and teaching style is the independent variable and the failure-withdrawal rate (end of course grades) in the nursing course is the dependent variable. The Kolmogorov-Smirnov statistical test, a non-parametric statistical test, was used to test the hypothesis. The test is concerned with the amount of agreement between the cumulative distributions of observed relative frequencies and expected relative frequencies. The test determines whether the distribution of the cumulative relative frequencies (in this case, end of course grades for matched

students) of the sample compares reasonably with the distribution of the cumulative relative frequencies expected (the base line data from non-matched students) under the null hypothesis.⁵

Additional aspects of the data will be analyzed in terms of non-parametric and parametric statistical tests. The following questions will be considered in relation to the data available:

- 1) Do students in the matched group perceive their instructor more positively than non-matched students as evidenced by responses on the Student Survey?
- 2) Do students in the matched group tend to receive higher grades than students in the non-matched group?
- 3) When students are assigned an instructional mode based on cognitive style, is measured achievement affected?
- 4) When students are assigned an instructional mode based on cognitive style, are reactions to the process favorable as indicated by their statements?
- 5) Do instructors perceive matching as a valuable tool in the teaching-learning process?
- 6) Does the absence of a cognitive style element affect probable success in a nursing course?
- 7) Does the makeup of a student's cognitive style map change after experiences in the nursing courses?
- 8) If changes occur in students' cognitive style maps, is there a pattern to such change?
- 9) Are faculty able to identify cognitive style elements of students with the aid of the Teachers Rating Scale: Nursing Students?

⁵Joseph E. Hill and August Kerber, Models, Methods, and Analytical Procedures in Educational Research, Wayne State University Press, Detroit, Michigan, 1967, p. 311-322.

Summary

Entering nursing students and the nursing faculty at Delta College, University Center, Michigan, were diagnosed as to cognitive style. The determination of teaching style involved students and faculty designations followed by each student specifying a preferred teaching style. A group of students were matched to faculty on the basis of cognitive style and preferred teaching style. End of course evaluations were used to determine differences in the achievement of matched and non-matched students. The experimental design used in the study was a Post-test Control Group Design. Two statistical hypotheses were generated to determine the effect of matching students' cognitive style and preferred teaching style with instructors' cognitive style and teaching style. The hypotheses were tested using the Kolmogorov-Smirnov statistical test. The probability level for rejecting the null hypothesis was at the .05 alpha level.

In order to identify possible answers to nine "hypotheses generating" questions, survey instruments and interviews were conducted. Additional statistical analyses were conducted on the data to suggest further areas of study.

CHAPTER IV

ANALYSIS OF DATA

Analysis of Data

The statistical hypotheses were tested using a Kolmogorov-Smirnov statistical test. End of course grades were used as the dependent variable to determine the effect of matching the student's cognitive style and preferred teaching style with the instructor's cognitive style and teaching style. The final grades were compared with the baseline data (Appendix G) as tabulated in Table 1.

TABLE 1.--Final Grades of Students in the Second Nursing Course Compared to Baseline Data.

Grades=	W/E	D	C	B	A
Matched Students $n_1 = 42$	9	1	10	13	9
Baseline Data $n_2 = 510$	89	18	109	178	116
Accumulated Frequencies $S(X_1) \quad 42$	9/42	10/42	20/42	33/42	42/42
$S(X_2) \quad 510$	89/510	107/510	216/510	394/510	510/510
Deviations $S(X_1) - S(X_2) = D$	$\frac{852}{21,420}$	$\frac{606}{21,420}$	$\frac{1,128}{21,420}$	$\frac{282}{21,420}$	0

In examining Table 1, it is observed that the maximum deviation (D) between the respective cumulative distribution is to be found in the third category of the distribution, i. e., the "grade" column of "C". The $D = 1,128/21,420$. Computing the critical value of D at the .05 level of significance is:

$$D = 1.36 \sqrt{\frac{n_1 + n_2}{(n_1 n_2)}} = \sqrt{\frac{42 + 510}{21,420}} =$$

$$1.36 \sqrt{\frac{552}{21,420}} \approx 0.21832$$

The computed value of the observed $D = 0.052661$, therefore the null hypothesis cannot be rejected. The null hypothesis states: When students' cognitive style and preferred teaching style is matched with the instructors' cognitive style and teaching style, the frequency of failure-withdrawal in that course will not be less than the failure-withdrawal rate of non-matched students. When the matched students are compared with the baseline data there is no statistically significant difference.

In considering the cumulative grade distribution of groups involved in this study, the matched group for Team 1 was compared to the total non-matched group. The final grades for the matched group were compared with the final grades of the non-matched group using the same Kolmogorov-Smirnov statistical test and are presented in Table 1.2.

In examining Table 1.2, it is observed that the maximum deviation (D) between the respective cumulative distribution is to be found in the third category of the distribution, i.e., the "grade" column of "C". The $D = 859/1995$ is computed according to the Kolmogorov-Smirnov statistical test. The critical value is computed to be .294 at the .05 level of significance. The observed D value ($859/1995$) is .4306, for the matched (#1) group. Although the null hypothesis cannot be rejected with the baseline data, the null can be rejected for the matched (#1).

TABLE 1.2--Comparison of Final Grades of Matched & Non-Matched Students in the Second Nursing Course.

	W/E	D	C	B	A
Matched Students (#) $n_1 = 21$	2	0	2	9	8
Non-Matched Students $n_2 = 95$	30	6	23	26	10
Accumulated Frequencies $S(X)_{21}$	2/21	2/21	4/21	13/21	21/21
$S(X_2)_{95}$	30/95	36/95	59/95	85/95	95/95
Deviations $S(X_1) - S(X_2) = D$	$\frac{440}{1995}$	$\frac{566}{1995}$	$\frac{859*}{1995}$	$\frac{550}{1995}$	$\frac{0}{1995}$
group compared to the total non-matched group.					

*value = .4306, significant at the .05 level

In examining the data presented in Table 1.2, and considering the results of the statistical analysis, it may be concluded that the matching of student's cognitive style and preferred teaching style with the instructor's cognitive style and teaching style may have had a positive effect on the failure-withdrawal rate of the matched group for Group #1. In considering the answers to the next two questions, additional data is presented which further supports the positive effects of cognitive style matching.

In response to the question, "Do students in the matched group perceive their instructor more positively than non-matched students as evidenced by responses on the Student Survey?" the following information was considered. Five items on the Student Survey dealt with the student's perception of the instructor.* The percent of students responding to each item is summarized in Table 2.

*Criteria for the selection of the items was the inclusion of the words "my instructor" and the connotation relative to cognitive style.

TABLE 2.--Comparison of Students' Perception of
Instructor in Matched and Non-matched Groups

Item	Strongly Agree	Agree	Disagree	Strongly Disagree
My instructor understands me and my learning needs.				
Matched	44	33	17	6
Non-matched	20	52	20	6
My instructor makes reason- able assignments and demands.				
Matched	38	45	8	9
Non-matched	30	53	10	6
My instructor gives me enough direction so I know what I should do.				
Matched	30	44	20	6
Non-matched	24	47	19	9
My instructor stimulates me to do my best.				
Matched	39	30	18	12
Non-matched	27	41	19	11

Responses to the Student Survey were assigned a numerical value of five for most favorable to one for least favorable. The maximum student rating score on the five selected items was 25 for most favorable and a minimum of five for least favorable. The mean score for

matched students was calculated and the mean score for non-matched students was calculated. A test for difference between means was performed using the t-test as described by Downie and Heath.¹ The mean scores, standard deviations and t-values are presented in Table 3 below.

TABLE 3.--Statistical Comparison of Students' Perception of Instructor in Matched and Non-matched Groups

Total Matched Group n ₄₃	Mean Score 19.0698	Standard Deviation 6.3823	t-value 2.39132*
Total Non-matched Group n ₉₃	16.4731	7.0735	

*.05 level of significance

It would appear from the results of the student survey and the statistical analysis of the students' responses, that those students who were matched with their instructor on the basis of cognitive style and preferred teaching style do perceive their instructor more positively. In analyzing the information relative to question two which

¹N. M. Downie, R. W. Heath, Basic Statistical Methods, Harper and Brothers, Publishers, New York, 1959, p. 127-131.

follows, additional data further deals with the differences between the matched and the non-matched student groups.

Question 2: "Do students in the matched group tend to receive higher grades than students in the non-matched group?" The final grades in the second nursing course are computed on a numerical basis as well as a letter grade. The final grade sheet shows a letter grade only, but the computed numerical scores were also available for this study. The grade scale used in the nursing course is as follows:

90 and above	A
80 to 89	B
70 to 79	C
60 to 69	D
59 and below	E

The mean grade scores of the matched students and the mean grade scores of the non-matched students were computed. The t-test for difference between means was calculated. The mean scores, standard deviations and t-values are summarized in Table 4. In this evaluation, the matched groups were treated in the two sub-groups for Group 1 and Group 2 and were compared separately and collectively.

TABLE 4.--Comparison of Mean Final Scores of Matched and Non-Matched Groups in the Second Nursing Course.

n Group	Mean	Standard Deviation	t-value
21 Matched #1	82.7143	12.6299	3.05156**
93 Non-matched Total	70.9467	16.5978	
21 Matched #1	82.7143	12.6299	3.41481**
22 Matched #2	68.2727	14.9418	
43 Matched Total	75.3256	15.5223	1.39071
93 Non-matched Total	70.9462	16.5978	
47 Non-matched #1	74.6808	14.9305	2.24076*
46 Non-matched #2	67.1304	17.4898	
43 Matched Total	75.3256	15.5223	2.33171*
46 Non-matched #2	67.1304	17.4898	
21 Matched #1	82.7143	12.6299	2.14439*
47 Non-matched #1	74.6808	14.9305	
22 Matched #2	68.2727	14.9418	0.26354
46 Non-matched #2	67.1304	17.4898	
68 Total #1	77.1618	14.6508	3.59792***
68 Total #2	67.5000	16.6047	

*.05 level of significance, **.01 level of significance,

*** .001 level of significance

Note the non-matched group for each team is similarly treated in this analysis. The computed t-value indicates a difference at the .05 level of significance for the means between the matched groups in all tests except where total matched and total non-matched groups are computed. For example, in column 1, row 1, the mean of the "matched group," 82.7143, when compared to the mean of the total non-matched group, 70.9467, the t-value of 3.05156 was found to be significant, i. e., to occur beyond the .01 level of significance. On the other hand, in column 1, row 3, dealing with the mean of the "matched total group," (75.3256) and the "non-matched total group" (70.9462), the t-value of 1.39071 did not occur beyond the .05 level. It should be noted that in all cases the "matched group" means were higher values.

It should be clearly understood that like any other instructional system, the results are not independent of the instructors, their positive attitudes and similar subtle elements involving complex human interactions. Such factors have had an impact on the findings of this study as suggested by the demonstrated differences in the two groups of students and faculty involved in this study. The differences between the means of Group I (matched plus non-matched) and Group II as indicated in Table 4 are significant. The faculty group I worked closely with the investigator and consistently demonstrated a high degree of enthusiasm and acceptance of the concepts involved in cognitive style

matching. The faculty group II, on the other hand, had limited contact with the investigator and demonstrated a "wait and see" attitude regarding the value of cognitive style matching. Even when these factors are considered the analysis of the data in Table 4 demonstrates that the mean final scores of the matched students are affected in a positive direction, that is in all cases analyzed in this study the students who were matched on the basis of cognitive style and preferred teaching style do have higher mean scores on the final grades than do the non-matched students.

Question 3: "When students are assigned an instructional mode based on their cognitive style, is measured achievement affected?" Each student in the second nursing course was assigned a specific instructional mode (autotutorial, discussion group, or read only) based on his individual cognitive style map as outlined in Chapter III. Each student was asked to use the assigned mode of instruction for the content of the selected lesson. At the end of the lesson a written quiz was administered during the usual integrated quiz session scheduled every week. The results achieved on the assigned lesson were compared with each student's usual achievement on similar testing instruments for similar lesson content. It would be expected that the students could perform as well as usual, less well than usual, or better than the usual performance on quizzes. The Pearson r

described by Downie and Heath was computed to determine if achievement was similar to prior performance.² The results of the comparison are presented in Table 5.

TABLE 5.--Comparison of Prior Mean Scores with Current Mean Scores for Groups Assigned Different Instructional Modes According to Cognitive Style.

n	Group	Mean Score for Instruct- ional Mode	Mean Score Prior Quizzes	Pearson r
24	ATL	70.2083	74.5417	0.67695*
41	Small Group Discussion	78.1219	76.9268	0.54600**
31	Read Only	81.1935	81.2000	0.27223

*.001 level of significance, **.01 level of significance

Although only the mean scores of the respective groups are shown in Table 5, the values of the correlation coefficients were calculated on the basis of paired scores, for each individual student. For example, in column 1, row 1, the mean score of 70.2083 represents the mean of 24 students' scores who received instruction by means of the auto-tutorial laboratory (ATL) approach. Each of these 24 scores were paired with the average score that each student had achieved in association with 13 quizzes taken throughout the course.

²Downie and Heath, Op. Cit., p. 84, 143.

The resulting values of the correlation of these two distributions was found to be $r = .67695$. This value of "r" was found to be significant at the $p = .001$ level.

Since the students achieved similar scores on the assigned instructional mode which matched the cognitive style elements of the student with the requirements of the learning task, it appears that other variables beyond the mode per se have an effect on the student's achievement. These students are highly motivated to achieve well in the nursing course and the opportunity to have instructional experiences "made to order" for their own learning style is viewed as "individualization" that allows them to learn with greater ease, less time, and more enjoyment.

Students who were assigned the instructional mode which best fit their own cognitive style performed very much like they had on prior quizzes as evidenced by the correlations. When the mean scores among the different instructional modes, autotutorial, small group discussion, and read only, are compared, the read only group is observed to have the highest mean. That same group had a high mean score on prior quizzes as recorded in Table 5. For purposes of comparison, the tests for significance between means (t-test) is presented in Table 6.

The small group discussion group shows a small increase in mean scores as evidenced by Table 5 where the mean score for the instructional mode is 78.1219 compared to a mean

TABLE 6.--Comparison of Mean Scores Among Groups
Assigned Different Instructional Modes.

n	Group	Mean	Standard Deviation	t-value
24	Autotutorial	70.2083	10.0520	2.73641*
41	Small Group Discussion	78.1219		
24	Autotutorial	70.2083	10.0520	3.43960*
31	Read Only	81.1935	12.8956	
41	Small Group Discussion	78.1219		1.04670
31	Read Only	81.1935	12.8956	

*.05 level of significance

on prior quizzes of 76.9268. That group is also higher on the mean score as compared to the autotutorial group mean of 70.2083 as presented in Table 6.

It appears that assignment to a mode of instruction based on the cognitive style of the student is more important to the student's achievement than the instructional mode itself. Some students will be able to achieve well in a read only mode, other students will be able to achieve well in a small group discussion mode, still others will achieve well in an autotutorial mode. Other factors contribute to the success of the various instructional modes as evidenced by the students' responses in the next question.

Question 4: "When students are assigned an instructional mode based on cognitive style, are reactions to the process favorable as indicated by their statements?"

At the end of the evaluation for the assigned instructional mode, students were asked to comment on the following items:

- 1) The most helpful thing about this lesson was...
- 2) The least helpful thing about this lesson was...
- 3) In the future I would recommend...
- 4) General comments...

The comments written by the students were submitted to content analysis as described by Hill and Kerber to provide data that might be categorically classified and evaluated, and therefore provide a description and interpretation of a situation or status not otherwise readily described.³ The content analysis provided the following statements about the experience relative to the assigned instructional modes:

"The most helpful thing about this lesson was...

"Sharing and relating the lesson to past experiences in our small group session."

"Getting together in the small group and exchanging ideas."

"Stressing of important points and confining the lesson to them."

"I was able to go at my own speed. I could absorb more when I found answers myself and had to write them down."

³Hill and Kerber, Models and Methods, Op. Cit., p. 109.

"I always enjoy learning."

"I enjoyed it because it was fairly easy."

"Seemed a bit more satisfactory."

"I like to study independently."

"I prefer learning by reading so I felt it was easier this way."

"I learn more from reading than listening to someone."

"This was a little bit better than usual."

"The ease of learning. If I can see how words are spelled instead of listening, I remember longer."

"I could do my lesson at my convenience and when I study best, for example, early morning when ATL would not be open."

"I liked the small group discussion."

"Enjoyed it more than previous method."

"Best lesson this semester!"

"The learning was easier for me this way."

"It wasn't easy. There was just as much work in it."

"Easier because I didn't have to guess what to study most."

Comments on the item, "The least helpful thing about this lesson was..."

"Group discussion; only because there were only two of us in the group...not enough feedback."

"I misjudged the amount of time needed for the small group session. We could have used another good hour."

"I didn't remember as much as I should."

"Little reinforcement of what I learned; less retention of knowledge."

"I was afraid I would not know all of the material I should."

"No discussion to clear any misconceptions." (read only student)

"Not enough time to meet with group."

Comments on the item, "In the future I would recommend..."

"Students allowed to choose learning method which suits them best."

"Placing the students with the teacher that they matched up with in the test given prior to the first nursing course."

"More matching! I agree I got more out of reading than trying to join a discussion group. It lets our personal preference mean something."

"More time to get organized. I didn't get a chance to get together with everyone because of working hours, baby sitter problems, etc."

"Not using this method."

"That this be tried more than once. I think that if I become accustomed to this way of learning, I would be able to absorb more."

"Each week changing the pattern, so that one is given the opportunity to examine and learn from each way."

"Small group discussion assignment."

Responses to the item, "General Comments..."

"This really would have been a good experience if more people would have taken it seriously. It was disgusting to me to do everything and then have students show up with very little preparation."

"I learned a lot about the students in this manner. One girl came to the group discussion without her materials or any reading done. Another girl never came at all. It makes a difference how willing a person is to learn, if she comes prepared or not."

"If this method of study was adopted as policy, I think the whole lesson would take on a different meaning. As it was, many students did not take the lesson seriously because we were 'guinea' pigs. I think it could be effective from what I've seen this week, but modifications would have to be made."

"I thought I could learn more easily by reading, but after going through this course, I find that I learn more by watching it done and doing it myself, or seeing pictures of it."

"I found this week to be quite enjoyable."

"I liked the idea of having the material written out. I think I can concentrate on the lesson more. I wished I could have had it for other lessons."

"Too bad we didn't do this every week!"

"I liked it!"

"I found this style very interesting and helpful. It involved communication and explanation which increased awareness and interest."

"This style of teaching is a good idea. With small group discussion sometimes one or two people lead the way. Everyone must do his part to make it interesting."

"I really recommend we start a schedule such as this soon."

"I felt it disrupted the whole pattern of learning I had established."

"It was interesting."

"I didn't spend near the time on preparation this week."

"It was a nice change."

"Give the student the choice of using any of the ways of learning."

Question 5: "Do instructors perceive matching as a valuable tool in the teaching-learning process?" Each of the instructors involved in this study were asked to respond to a Nursing Faculty Survey Form (complete form is in Appendix D). Selected statements and the faculty responses to these statements are summarized in Table 7.*

*The criteria for the selection of these particular statements was the inclusion of the term "cognitive style" and/or connotation of reaction to the process of cognitive style matching.

TABLE 7.--Faculty Reaction to Cognitive Style Matching.

Item	Strongly Agree	Agree	Disagree	Strongly Disagree
Cognitive style matching is helpful to me as an instructor. (1 blank)	2 8	8 62	2 15	0 number 0 percent
Cognitive style matching has not affected anything I did this semester.	2 15	5 38	5 38	1 number 8 percent
I would favor cognitive style matching for all students and faculty.	2 15	5 38	6 46	0 number 0 percent
Cognitive style matching should be continued. (1 blank)	4 31	4 31	4 31	0 number 0 percent
This semester has been personally fulfilling.	9 69	2 15	1 8	0 number 0 percent

The following is a summary of the written comments submitted by the faculty regarding cognitive style:

"The cognitive style matching seemed to have a positive affect on the students. They had a feeling of 'belonging' to the group on the first day. This was a very positive force in group interaction and instructor rapport. It was a tremendous experience! Give me another 'matched' group any time!"

"I've really enjoyed teaching this semester! I feel much of this attitude is related to the cognitive style matching. I've felt that I could really relate to the students not only as an instructor, but as a person."

"On the whole the group seemed to do well under my instruction."

"Though I was not matched with my section, I found the knowledge of their learning styles helped me present materials and learning situations to the individuals in a meaningful way."

"Cognitive style matching was most valuable! By all means continue its use. The knowledge of individual student's learning styles helped me to understand the behavior rather than being irritated. Faculty were better able to communicate with each other; they seemed more accepting of behaviors where in the past they have tended to criticize. I was more able to predict how an individual student and/or faculty would react in a situation when I was familiar with his cognitive style."

"This semester there seemed to be some square pegs in round holes despite the fact we were supposedly matched according to cognitive style."

"Cognitive style identification would be helpful."

"The interview session served to reinforce my original perceptions of individual students, and perhaps to reveal the why's of their behaviors."

In examining the faculty responses in Table 7, it is noted that 62% of the faculty (8) state cognitive style matching should be continued. It should be noted as described in Chapter III, that each instructor had both matched and non-matched students in her group. The instructors may have expected a greater degree of similarity in cognitive style of their students than in truth did occur due to the student's option to change sections. Since the faculty did not know which students were "matched" with

their cognitive style and teaching style, this may have been a factor in their reactions. Despite this reaction, note that 84% of the instructors state the semester had been a personally fulfilling experience.

Question 6: "Does the absence of a cognitive style element affect probable success in a nursing course?" In order to answer this question the cognitive style map of each student was reviewed in order to identify the absent or negligible cognitive style elements; that is a search was made of each map to see what elements a student did not have indicated in his learning style. The frequency of the missing or absent elements was tabulated for each student who had been originally diagnosed in the categories of those students who had passed the nursing courses and those students who had failed or withdrawn from the first or second nursing course. The frequency tabulations are available in Appendix L. It was noted that the element, Theoretical Auditory Quantitative, T(AQ), was absent for 18 students who had passed while the same element was absent or missing for 27 of the students who failed a nursing course. The total missing elements for the students who failed was 178 while the total of missing elements for the students who passed was 121. It would appear that the higher number of elements the student has in his cognitive style map, the greater is his possibility for passing in the nursing courses.

In considering this question from another perspective, the missing or absent elements were tabulated according to the grades earned in the nursing courses. The tabulated frequencies for the missing or absent cognitive elements according to final nursing course grades is available in Appendix L. In examining the totals for each grade category, the least number of missing elements occurs in the "A" category. While further study of this phenomenon is necessary to draw conclusions, it could appear from initial analysis that clues to probable success or failure of nursing students can be found in the elements present or absent in their cognitive style maps.

Inasmuch as the cognitive style diagnosis procedure included a reading level for each student, it was possible to analyze these scores for potential clues relative to success in the nursing courses. The reading level for each student was tabulated according to his grade achievement in the nursing courses. If the student failed in the first nursing course, his reading level was recorded in a separate category. Students who started the second nursing course were tabulated according to final grade achieved, i.e., A, B, C, D, W/E. The summarized tabulations are available in Appendix K. These tabulations indicate reading levels below 5.9 have no students in the "A" category, although there are two students in the "B" category with reading level 5.0 to 5.9. Those students (7) who had reading levels below 4.0 failed in the first nursing course. As a part

of this study additional information was examined, and the mean scores for reading level were calculated for the matched and non-matched groups of students. For the "matched" students the reading level mean was 8.0368 and the non-matched reading level mean was 7.9695. Evidence relative to the reading level is at this time non-conclusive except as noted with the lower levels.

Question 7 and Question 8 are considered jointly: "Does the makeup of a student's cognitive style map change after experience in a nursing course? If changes occur in the student's cognitive style map, is there a pattern to such change?" At the conclusion of this study it was possible to re-test a small group of students (16) who had been tested approximately one year earlier. The two cognitive style maps for each student were analyzed to identify possible changes that might have occurred. The raw scores for each of the cognitive style elements produced by the diagnostic procedure, were tabulated and a determination of increase or decrease in each element was computed. A sample computation for identification of changes in cognitive style is presented in Appendix J. In computing the positive and negative changes in the cognitive style, that is, increases on raw scores on elements and decreases on raw scores, there was a range of 39 to 110 change points noted. Based on the limited observation of these students, it would appear that changes do occur in

the cognitive style map.

In addition to the above described procedure, the two cognitive style maps for each student were examined to determine changes which may have taken place as far as an element rating of major, minor, or negligible. In order to facilitate the evaluation of potential changes, a number value was assigned to the major and minor elements; that is, two points were assigned to a minor element, three points to a major element and 0 points for a negligible element. If a student's map indicated a change from a major to a minor or from a minor to a negligible or absent element, a decrease in the point value was recorded accordingly. If the student's map changed from an absent (negligible) element to a minor, or from a minor to a major, the change was recorded as an increase according to the point values. The summary of changes in the cognitive style elements of these students is available in Appendix H. In examining the changes which are recorded in the students' cognitive style maps, the greatest number of changes appear in the third set, Modalities of Inference, with 56 points of change recorded. This suggests there have been changes or augmentations in the student's learning styles. McAdam described five ways in which a student might change or augment his learning style. Paraphrased they are described as follows:

- 1) increased level of educational development
- 2) increased reading level
- 3) increase from a minor to a major element
- 4) increase from a negative to a minor element
- 5) elimination of elements in the modalities of inference set that tend to contribute to variability in reasoning which acts to the disadvantage of the individual in dealing with an educational task.⁴ Although the first four points are obvious in their pertinence to the process of changing cognitive style, the fifth point requires a brief discussion. Suppose that an individual shows the following elements in the modalities of inference set of cognitive style:

$$\left\{ \begin{array}{cc} D & L \\ & (K) \end{array} \right\}$$

McAdam points out that two such individuals in his study showed a greater capacity to deal with educational tasks demanding an appraisal (L) approach after the "Difference" (D) modality had become negligible, i.e., not appearing, in the cognitive style of the individual. This conclusion was based upon observations by a jury, panel of three persons with extensive backgrounds in the Educational Sciences, and testimony of the two study participants. A number of changes (10) are noted in the "Difference" modality of inference for the nursing students; in truth, the greatest number of changes in the cognitive style maps are recorded for the "Difference" (D) mode.

⁴Glenn F. McAdam, Personalizing Instruction through the Educational Sciences of Cognitive Style and Teaching Style, unpublished doctoral dissertation, Wayne State University, 1971.

In addition to the two procedures just summarized, an effort was made to measure the changes that might have occurred in relationship to the instructor's cognitive style map. The instructor's cognitive style map was assigned a numerical rating as described in Chapter III (two points for each cognitive style element). Each of the student's two maps were computed as to closeness of match using the matching formula described earlier. For example, instructor #1 had 38 elements for matching (two points for each element present), and student #1 had 28 matching points for the first map to produce the numerator $28/38$ and the resulting value of .736842. This same student had 30 matching points on the second map for a value of $(30/38)$.789473. The difference between the two cognitive style maps is a value of $+.052631$ in the direction of the instructor's cognitive style. If the change in the student's cognitive style map produced a lesser match (as with student #1 for instructor #2), a negative level was assigned to the change as with the student mentioned above, the value becomes $-.30556$. The changes recorded with this procedure are summarized in Appendix J. The tabulations are available in Appendix M.

Although this is insufficient data to support a major conclusion, it does appear that changes do occur in the cognitive style map which can be determined in relation to other phenomena in a related fashion. All the students who had the repeat diagnostic studies had been successful

in the nursing courses and did volunteer to participate in the repeat test session. Most of these students also came in for a conference evaluation of the changes that had taken place in their cognitive style maps and offered confirming comments relative to the identified changes.

Question 9: "Are faculty able to identify cognitive style elements of students with the aid of the Teachers Rating Scale: Nursing Students?" In order to answer this question three faculty members used the developed Teacher's Rating Scale (Appendix B) in relation to the same students who had submitted to the repeat diagnostic testing procedure. The students were not aware that the teachers were rating them, but the additional data served as an additional base for possible comparison. The three instructors had not been associated with the study group and had a limited experience in relation to cognitive style elements as presented in the initial workshop almost one year previously. The elements identified by these three instructors did not consistently agree with the major and minor elements of the student's cognitive style map, although there was more agreement of the absent or negligible elements. Since the raters were inexperienced, it is possible additional preparation would be beneficial in producing more conclusive results. The evidence produced in the described circumstances is inconclusive.

Summary

The effects on student learning of matching students' cognitive style and preferred teaching style with the instructor's cognitive style and teaching style were determined by the Kolmogorov-Smirnov statistical test. The null hypothesis cannot be rejected when the matched group of students is compared to the baseline data. The null hypothesis can be rejected at the alpha level of .05 for the matched #1 group when compared to the non-matched group.

In order to answer nine "hypotheses generating" questions additional data was secured and analyzed.

The answers to questions posed by the study comprise the conclusions derived from the effort. These answers, along with implications and recommendations for consideration of further study are discussed in the next chapter.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

The study reported had two purposes: One purpose was to determine the effect of matching the student's cognitive style and preferred teaching style with the cognitive style and teaching style of the instructor. A second purpose of this study was to seek possible answers to eight questions in selected hypotheses generating activities.

The hypothesis which this study tested is restated as an introduction to the conclusions: Students in the associate degree nursing program at Delta College have decreased withdrawal and/or failure rate in a nursing course when students' cognitive style and preferred teaching style are matched with instructor's cognitive style and teaching style. In the process of testing the research hypothesis, it was proposed that additional hypotheses would emerge to be stated in the form of questions for further investigation.

The purpose of this chapter is to state the conclusions of the study regarding the hypothesis and questions raised in Chapter I. A secondary purpose is to explore selected implications of the answers to the questions

presented. In conclusion some recommendations for further study will be put forth based on the information derived from this study.

Conclusions

In relation to the statistical hypothesis an analysis of the data supports the following conclusions:

1) When the cognitive style and preferred teaching style of students is matched with the cognitive style and teaching style of faculty, the failure-withdrawal rate is not significantly different when compared to the baseline data.

2) When the cognitive style and preferred teaching style of students is matched with the cognitive style and teaching style of faculty, the failure-withdrawal rate of one matched group was decreased when compared to the non-matched group at an alpha level of .05.

In relation to the questions posed, the answers to each question are based on the analysis of the data and information reported in Chapter IV. Each question will be re-stated and the conclusions derived from the study will follow.

Question 1: "Do students in the matched group perceive their instructor more positively than non-matched students as evidenced by responses on the Student Survey?"

It is the conclusion of this study that matched students do, to a significant degree, perceive their

instructor more positively than do the non-matched students. The mean scores for the matched group and the mean scores for non-matched group were compared with the use of the t-test and were found to be significantly different at the alpha .05 level of significance.

Question 2: "Do students in the matched group tend to receive higher grades than students in the non-matched group?"

It is the conclusion of this study that matched students do achieve higher mean scores than the non-matched students. The matched group #1 consistently achieved higher mean scores when compared to the non-matched groups at a .05 significant level. The mean scores of the matched groups were compared with the mean scores of the non-matched group and a test of significance of difference with the t-test indicated the matched group #1 was higher than the non-matched group at the .05 level of significance.

Although group 2 matched and non-matched did not have significantly higher mean scores when compared with group 1, the mean scores of the matched group are in a favorable position. The influence of other factors, such as faculty attitudes and enthusiasm, in student achievement must be considered. In conclusion, all students in group 1 (matched and non-matched) achieved higher mean scores than all students (matched and non-matched) in group 2 at a .001 level of significance.

Question 3: "When students are assigned an instructional mode based on their cognitive style, is measured achievement affected?"

It is the conclusion of this study based on the evidence examined, that the students who were assigned an instructional mode based on their cognitive style achieved at a level close to their prior achievement on similar types of learning. One group, the small discussion group, did show an increase in mean scores over prior mean scores. There was a high correlation on the assigned instructional mode with the prior instructional approaches as evidenced by the Pearson r test which was significant at the .001 level for the autotutorial group and at the .01 level for the small group discussion group. The study demonstrates that the "read only" group mean score remained approximately the same, although there was not a significant correlation as indicated by the Pearson r test for significance. Although the t -test for significance of difference between means indicates the two groups, small group discussion and read only, achieved higher mean scores than the autotutorial group at a .05 level of significance, the correlation test with the Pearson r indicates the achievement for those two groups of students is not significantly different than prior achievement of the same group of students.

Question 4: "When students are assigned an instructional mode based on cognitive style, are reactions to the process favorable as indicated by their statements?"

Based on the content analysis of the statements submitted by the students there was favorable response to the assignment of the instructional mode. Students viewed the experience as a welcome change from the usual procedure. Several students would prefer to have a choice among instructional modes for each lesson.

Question 5: "Do instructors perceive matching as a valuable tool in the teaching-learning process?"

It is the conclusion of this study that faculty do perceive the matching as a valuable tool based on the responses to the Nursing Faculty Survey. Cognitive style matching was perceived by 70% of the faculty (10) to be a helpful tool in the teaching-learning process. The continuation of cognitive style matching was recommended by 62% of the faculty (8).

Faculty comments indicate an additional benefit from the cognitive style matching was the improved communication among the faculty and an increased tolerance for behaviors which might ordinarily be more criticized than understood.

Question 6: "Does the absence of a cognitive style element affect probable success in a nursing course?"

It is the conclusion of this study that the greater number of cognitive style elements the student has in his

cognitive style, the greater is the possibility of passing in the nursing courses. An analysis of the elements absent from the cognitive style maps indicated students who achieved "A" grades had the least number of missing elements. Students who have reading level below 4.0 failed in the first nursing course, although students with higher reading levels also failed; evidence relative to predicting success in the nursing course is inconclusive at this time.

Questions 7 and 8: "Does the makeup of a student's cognitive style map change after experience in a nursing course? If changes occur in the student's cognitive style map, is there a pattern to such change?"

It is the conclusion of this study that the student's cognitive style maps do change, based on the numerical analysis of the cognitive style maps for the students who were "re-diagnosed." Based on the study of these maps, it is not possible to predict the direction of changes or augmentations. There were more changes in the direction of the instructor's cognitive style map, but other factors need to be determined which were beyond the scope of this study.

Question 9: "Are faculty able to identify cognitive style elements of students with the aid of the Teachers Rating Scale: Nursing Students?"

The evidence produced in this study is insufficient to make a conclusion relative to this question. The three

raters were able to recognize the negligible elements (missing) more readily than they were able to distinguish the degree to which an element was present, minor or major in ratings. Further study and investigation is necessary to provide more conclusive results.

Discussion

In considering the impact of cognitive style matching on the teaching-learning process, this study has considered various measures of the effectiveness as perceived both by students and faculty. Both the students and faculty have perceived this tool as a valuable dimension to help the teacher to relate, care about student learning, and to act as a facilitating agent in the learning process.

The potential for cognitive style in the individualization of instruction holds promise in that optional ways for individuals to learn a prescribed task are present. As Petro indicated, it is the artistry of the teacher which has a powerful impact on the quality of the students' learning experiences; cognitive style matching and identification provides an additional dimension for the teacher to develop artistry.¹

Recommendations

Two types of recommendations are given below. One type deals with the refinements of this type of study, the other type concerns additional studies which would provide more

¹Petro, Op. Cit., p. 69.

precise answers to some difficult questions dealing with nursing education.

A replication of this study with selected refinements may produce more precise results. An important factor would be to have cognitive style matching for entire groups of students rather than a mixture of matched and non-matched. Given the opportunity to freely assign students to an instructor, a group of high-degree matched students could be compared to a group of "high-degree" non-matched students. The effect of specific faculty re-enforcing behaviors should be studied in relation to the changing of cognitive style maps; that is, if the faculty member gives praise and/or recognition to behaviors which use the appraising (L) approach, does the student develop greater appraising type behaviors (L)? Given a faculty member who considers "relationship" type behaviors to be more important, (and rewards these kinds of behaviors) does the student develop more (R) relationship type behaviors?

Additional studies need to be conducted to explore the following areas as relating to nursing education:

- 1) What are the cognitive style requirements for specific learning tasks? That is, what elements does a student need in order to learn how to take a blood pressure? What cognitive elements does he need in order to carry out a patient assessment?

- 2) When learning materials are prepared to fit the requirements of the learning task and the student's learning style, is student learning achievement improved?
- 3) Given free choice of selecting different modalities of learning, will the student vary his learning approaches? Will there be a measurable difference in the achievement of the student?
- 4) What techniques produce augmentation (changes) in a student's cognitive style in a predictable direction?
- 5) What elements in cognitive style predict a nursing student will perform at an expected level in specific nursing settings; i.e., public health, emergency room, intensive care, medical nursing?
- 6) What elements in cognitive style predict a "compatible" group of faculty?

In an effort to identify possible "predictors" of success in the nursing program at Delta College, this investigator tabulated as much information as was available dealing with cognitive style of students, faculty, and course achievement. Since there is little evidence currently available that will predict success in the nursing course (high school grades, IQ, SAT, GPA, have not been predictive), these described variables were examined. Correlations using

the Pearson r and tests of difference between means using the t -test, were run on the data for the matched and non-matched groups of students as well as the total group of students. Although the data at present is conclusive, it appears highly probable that a longitudinal study may produce important information relative to cognitive style elements and possible predictors of success in the nursing program. Some of the analyzed data suggests the following factors may be related, and should be studied further:

- 1) The possible relationship between T(VL) theoretical visual linguistic and success in nursing. The matched group #1 showed a correlation of 0.34870^* (Pearson r) for these two variables.
- 2) The relationship between success in the nursing course and Q(CK) Qualitative code kinesics. The matched group #1 showed a negative correlation of $-.45206^*$ (Pearson r) for these factors.
- 3) Magnitude inferential (the person who follows the rules and wants things well spelled out) as well showed a negative correlation with success in the course ($-.51389^*$). "Differences" (D) had a positive correlation with success in the course indicated by a Pearson $r = .33883$. Does the student come with these cognitive style elements, or does the nursing program stimulate him to develop these

* .05 level of significance.

modalities of inference? What is the faculty role in the teaching-learning process in relation to the development of inferential patterns?

- 4) Faculty qualifications were also correlated with student success in the course and found to rate high on the Pearson $r = .52844^*$. That is the higher were the faculty qualifications as far as advanced degrees, teaching experience, work experience, and full time status, the higher was the students' achievement. This suggests in depth study of faculty in relation to student achievement may be beneficial as well.

It appears probable that a longitudinal study (five or more years) of the identified factors may be beneficial in the identification of valid predictive elements in relationship to the potential success in a course of nursing studies.

* .05 level of significance.

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Personal Interview with Dr. Howard Hagerman, Associate
Professor, Lyman Briggs College, Michigan State
University, East Lansing, Michigan, November 10,
1970.

APPENDICES

APPENDIX A

IDENTIFICATION OF TEACHING STYLE

IDENTIFICATION OF TEACHING STYLE

FACULTY FORM

Teachers may possess major and/or minor teaching styles drawn from the following:

Predominant -P- consistently employing a fixed style of teaching, either authoritarian or permissive.

Flexible -B- uses a style that appears to be best for each individual student.

Adjustive or Switcher -S- begins on the basis of the student's style and switching him to the teacher's preferred style.

It is assumed that teachers would not demonstrate one particular style to the exclusion of the others, therefore individuals are usually assigned combinations of two styles (i.e., Predominant - switcher, Switcher - flexible).

Of the teaching style described above, please indicate your teaching style as you perceive it.

Teaching Style _____

Name _____

Of the students you presently have in your clinical group please indicate the following:

Student who appears most compatible with your teaching style _____

Student who appears least compatible with your teaching style _____

This information will be used in matching students with faculty for the January Term; then destroyed as to specific names.

IDENTIFICATION OF TEACHING STYLE

STUDENT FORM

Name _____

Present Section _____

Teachers may possess major and/or minor teaching styles drawn from:

P- Predominant- consistently employing a fixed style of teaching, either authoritarian or permissive.

B- Flexible- uses a style that appears to be best for each individual student.

S- Switcher or Adjustive- begins on the basis of the student's style and switching him to the teacher's preferred style.

It is assumed that teachers would not demonstrate one particular style to the exclusion of the others, therefore individuals are usually combinations of two styles (i.e., Predominant - switcher, Switcher - flexible).

Of the teaching styles described above, please indicate the teaching style of your present instructor (clinical) as you perceive it.

Teaching Style Present Instructor: _____

Please indicate below the teaching style you think you would prefer your next instructor to possess.

Next Instructor Preferred Teaching Style? _____

Comments you would like to offer about an instructor you would prefer to have next semester:

SUMMARY OF TEACHING STYLES OF FACULTY IN STUDY

Teaching Styles are summarized as follows:

- P = Predominant: consistently employing a fixed style of teaching, either authoritarian or permissive.
- B = Flexible: uses a style that appears to be best for each individual student.
- S = Switcher or Adjustive: begins on the basis of the student's style and switching him to the teacher's preferred style.

It is assumed that teachers would not demonstrate one particular style to the exclusion of the others, therefore individuals are usually assigned combinations of two styles with a major being designated by an upper case letter and a minor with a lower case letter.

Teacher	Designated Style
1	P b
2	B p
3	P s
4	B p
5	S b
6	S p
7	P b
8	B s
9	B s
10	B p
11	B s
12	P s

APPENDIX B

TEACHER'S RATING SCALE

Students of Nursing

Rating Key
to be used with IBM cards

A = Always
B = Usually
C = Sometimes
D = Rarely
E = Never

TEACHER'S RATING SCALE

Nursing Students

CARD A

Cognitive Style Element

T (AL) - Obtaining meaning from spoken words
Theoretical Auditory Linguistic

1. The student remembers information discussed in pre-conference as evidenced by being able to re-tell the information or answer questions about it.
 2. The student can describe an incident that occurred in patient care.
 3. The student is able to follow directions.
 4. The student participates in conferences with other students and/or the teacher.
 5. Uses medical terminology in discussing patient care.
-

T (VL) Theoretical Verbal Linguistic - Obtaining meaning
from written words

6. The student can summarize or answer questions about information he has read (text book, doctor's orders, patient record, kardex)
 7. The student reads more than the assigned readings.
 8. Shows evidence of having read about clinical assignments.
 9. Reviews prior readings such as basic science, prior course readings as it relates to present activities.
 10. Written work usually complete
-

T (AQ) Theoretical Auditory Quantitative - Obtaining
meaning from spoken numbers

11. The student can calculate drug dosages correctly from information presented orally.
12. The student can remember the patient's room number.

13. The student can remember his student number.
14. The student can follow verbal directions that contain numbers.
15. The student can compute the rate of flow for an I.V. from oral information.

T (VQ) Theoretical Visual Quantitative - Obtaining Meaning from written numbers.

16. The student solves drug dosage problems most easily when he writes them on paper.
17. The student can identify the amount of drug in a given quantity (i.e., 50 mg per) ml.) from the written label.
18. The student can convert from apothecary to metric system with a conversion chart.
19. The student can calculate the rate of I.V. from written information.
20. The student can accurately copy the amount of drug ordered from the chart or kardex.

Q (A) Qualitative Auditory - Obtaining meaning from non-verbal sounds

21. The student can identify differences in breathing patterns by listening to the patient's breath..
22. The student can identify hospital noises by their sounds.
23. The student can identify the heart beat when he listens with the stethoscope.
24. The student can identify patient distress sounds, i.e., moan, groan, crying.
25. The student can identify breath sounds when he listens with a stethoscope.

Q (O) Qualitative Olfactory - Obtaining meaning from odors, smells or aromas

26. The student can identify deviations from usual odors in a patient's room, charts and reports these (i.e., vomities, foul sputum, fecal material, wound discharges, etc.)

27. The student takes action to improve or alter unpleasant odors in the patient's room (i.e., removes foul materials where possible, provides air circulation, deoderants).
 28. The student will comment on the patient's perfume or aftershave lotion.
 29. The student comments on the odors in the patient's room or in the clinical setting.
 30. The student will smell particular items to determine status; i.e., the patient's breath, the cast, wounds, etc.
-

Q (S) Qualitative Savory.- Obtaining meaning by the sense of taste.

31. The student can tell the difference between sweet and sour milk by tasting.
 32. Given a patient who complains that a food tastes bad, (too salty, too flat, too spicy, etc.) the student will appropriately taste the food to assess the situation.
 33. The student comments on the taste of particular foods.
 34. The student refers to and/or shares recipes for particular foods.
 35. The student can taste when foods are too salty.
-

Q (T) Qualitative Tactile - The ability to obtain meaning by the sense of touch.

36. The student is able to feel the radial pulse within a reasonable period of time, i. e., five to fifteen seconds.
37. The student is able to feel the rise and fall of the chest during respirations.
38. Given a patient who appears flushed or pale, the student will feel the skin to determine skin temperature.
39. Given a patient with a casted extremity, the student will feel the extended parts (i.e., toes, fingers) to determine temperature.
40. Given a patient with a distended body part, the student will feel the part to assess the status (i.e., distended abdomen, edematous legs and feet).

Q (V) Qualitative Visual - The ability to obtain meaning by the sense of sight.

41. The student can see the difference in patient skin color due to circulatory status; i.e., flushed, pale, cyanotic as evidenced by reporting or recording.
42. The student can see that the patient is in correct body alignment or incorrect alignment, as evidenced by reporting and/or actions to change the position.
43. The student can see changes in skin color in a particular area as a result of pressure on the part as evidenced by reports and/or nursing actions.
44. Given a patient with jaundice the student will see the skin coloring as evidenced by reporting or recording.
45. The student is able to accurately count the respiratory rate by seeing the chest rise and fall.

Q (P) Qualitative Proprioceptive - The ability to obtain meaning through coordinated inputs; sometimes referred to as the "sixth sense."

46. The student can coordinate two or more senses, such as seeing and hearing, to take a blood pressure.
47. The student can coordinate muscle activity with seeing, i.e., putting on an ace bandage or a breast binder.
48. The student can "size up" the patient situation and realize that all is not well with the patient.
49. The student can perceive the patient's muscle response to a nursing care activity, i.e., cleansing a wound.
50. The student can "size up a load" and move things smoothly.

CARD B

Q (CEM) Qualitative Code Empathetic - The ability to put yourself in another person's situation.

1. The student listens to the patient's problems.
2. The student expresses concern about the patient's problems.

3. The student takes action to assist the patient with a particular problem if possible, i.e., takes action to relieve pain.
4. The student acts as the patient's advisory when and where possible.
5. The student says kind things about the patient.

Q (CES) Qualitative Code Esthetic - The ability to enjoy the "beauty" and "purenness" of an object, situation, or idea; a sense of orderliness and beauty.

6. The student comments on the environment as pleasant, unpleasant regarding color, space, lighting.
7. The student presents a neat and orderly personal appearance with clean, pressed uniform, neat hair style, etc.
8. The student leaves the patient's environment in an orderly state.
9. The student comments on how pretty things are.
10. The student expresses enjoyment of music, art and/or ideas.

Q (CET) Qualitative Code Ethic - A commitment to a set of values, a group of moral principles, obligations, duties.

11. The student sets high standards of nursing care for self and others.
12. The student reports situations as they occur to maintain safe patient care, i.e., records exact time a medication is given, reports errors, etc.
13. The student gives correct information to patients and families, when in doubt, secures correct information.
14. The student carries out the plan of patient care.
15. The student gives evidence of high integrity in carrying out written assignments and quizzes.

Q (CH) Qualitative Code Histrionic - Staged behavior or the deliberate use of a set of behaviors to produce some particular effect on other persons; role-playing.

16. The student is able to play an assigned role in a classroom situation particularly if he views the role as the "good" person.
17. The student is able to play an assigned role in a classroom situation even when the role is the "bad" person.
18. The student is able to act out the role of "nurse" in the patient's presence.
19. The student likes to take the role of patient or doctor in a play acting situation.
20. The student is able to behave in different ways to achieve changes in patient behavior.

Q (CK) Qualitative Code Kinesics - The use of non-verbal functions such as shrugs, smiles, gestures, body motions, blushing to communicate.

21. The student uses gestures in response to questions.
22. The student uses gestures to communicate with a non-hearing patient.
23. The student blushes.
24. The student shows pleasure and/or displeasure through body motions.
25. The student uses gestures and body motions in describing patient care activities.

Q (CKH) Qualitative Code Kinesthetics - Motor skill ability.

26. The student carries out procedures smoothly, without awkwardness or shakiness.
27. The student is able to get things done in a reasonable period of time.
28. The student enjoys doing things with the hands, i.e. backrub, injections.
29. The student has a good sense of balance.
30. The student has good muscle control.

Q (CP) Qualitative Code Proxemics - Ability to determine critical physical and social distances between one self and another as defined by the other person.

31. The student knows about how far he should stand from the patient who is talking to him.
 32. The student is able to determine that it would be acceptable to hold the patient's hand.
 33. The student waits to be invited before joining a group at coffee break.
 34. The student introduces himself to other members of the health team at appropriate times.
 35. The student determines when the patient would prefer to be alone and/or silent.
-

Q (CS) Qualitative Code Synnoetics - Personal knowledge of oneself in relation to one's environment.

36. The student makes realistic work plans for his time in the clinical laboratory.
 37. The student is able to determine when he needs help in moving or lifting a patient.
 38. The student is able to identify correctly when he needs the instructor's assistance.
 39. The student is aware of (or accepts from others) his weakness and attempts to improve these.
 40. The student is aware of his strengths and builds on these.
-

Q (CT) Qualitative Code - Transactional - The ability to influence others.

41. The student tries to convince the group to do things his way.
42. The student will be selected by other class members for responsible roles.
43. The student is able to convince the patient to engage in a particular activity, i.e., ambulate, deep breathe and cough.
44. The student is able to do effective patient teaching.

45. The student is able to secure positive action from other members of the health team to the patient's benefit.

CARD C

A - Associates - Represented by the various groups with whom the student has the greatest contact (fellow students in nursing).

1. The student will share materials and information with others.
 2. The student prefers to work with another student.
 3. The student follows the example set by other students in nursing.
 4. The student is influenced by the decision of other students.
 5. The student tries to find out what the group thinks is best in a given situation.
-

F - Family - Either immediate or extended or surrogate changing throughout life.

6. The student makes references to his family members and their activities.
 7. The student compares a patient care situation to a family member, i.e., mother, father, husband, wife, etc.
 8. Family commitments have high priority for the student's time.
 9. The student is concerned about how the family will respond to what he does.
 10. The student consults with a family member before he decides to do particular things.
-

I - Individuality - The knowledge that his way is best along with the ability and willingness to direct his behavior accordingly.

11. The student will not let other students change his position or decision.
12. The student prefers to carry out patient care activities by himself, i.e., does not like to be on a multiple assignment.

13. The student makes independent nursing care decisions.
14. The student prefers to study by himself.
15. The student accepts the fact that he is frequently a leader in the clinical group.

D - Difference - Contrasts selected characteristics on a one-to-one comparison of difference.

16. The student can identify shades of difference in a patient's skin color, i.e., shades of paleness, shades of cyanosis - as evidenced by reporting and recording.
17. The student can see small differences in a healing or non-healing wound as evidenced by reporting or recording.
18. The student contrasts present vital signs with the vital signs measured previously to determine differences.
19. The student contrasts the responses of a patient with a particular disease with another patient having the same disease.
20. The student compares one health worker with another to identify differences, i.e., the doctor's orders written by two doctors for similar situations.

M - Magnitude inference - A form of "categorical thinking," using categories, definitions, authority sources.

21. The student frequently quotes the teacher or the text book or the rules to others.
22. The student prefers to have specific step-by-step directions for each task.
23. The student arranges his written work in neat columns or outline because "that is the way to do it."
24. The student carries out nursing care activities because the "head nurse said to do it" or that is "what the doctor ordered."
25. The student wants new terms defined as they are introduced; he uses a dictionary frequently.

R - Relationships - Comparison of two or more selected characteristics to determine similarities.

26. The student will make statements such as, "this patient's wound looks like another patient..."
 27. The student relates new information to similar information he has had previously.
 28. The student compares several pieces of similar information, i.e., all the similar laboratory reports.
 29. The student frequently says, "that's just like..."
 30. The student enjoys relating information or experiences with patients or family that are similar to the situation being presented.
-

L - Appraisal - The application of Magnitudes, Differences, and Relationships in reaching a probability conclusion.

31. When asked to make a decision, the student says he needs time to think about it.
 32. The student often criticizes multiple choice or true-false test items.
 33. The student gives many details before he gets to the point in describing a nursing care situation.
 34. The student reaches different conclusions in similar situations and may be perceived as "inconsistent."
 35. The student has difficulty making "snap" decisions, and dealing with emergency type nursing care situations.
-

K - Deductive inferential process

36. The student enjoys the type of reasoning used in solving mathematical problems, i.e., $a = b$, $a = c$, therefore $b = c$; infection produces elevated temperatures ($a = b$), infections produce elevated white blood count ($a = c$), therefore elevated temperature produces elevated white blood count ($b = c$).
37. The student enjoys problems in which the solution is deduced from the rules.

38. The student defends his actions in "logical" progression.
39. The student does not like to be in a situation where he cannot predict the outcome.
40. The student expects patients to react to his nursing care in similar ways.

APPENDIX C

NURSING STUDENT SURVEY

NURSING STUDENT SURVEY
#0320721
CML

Dear _____:

I need your help! A list of statements follows about the nursing course and instructors. By responding to these items you will help to improve teaching methods. Think about each item in relation to your experience while you were in the nursing course or courses. Please return your completed paper in the return envelope as soon as possible. If you have any questions or problems, please telephone me at home in Saginaw, 792-0807 or at Delta, 686-0400, ext. 274 or 288.

Thank you for your assistance.

Mrs. Crystal M. Lange

Use the following key for each statement:

1. Strongly agree
2. Agree
3. Disagree
4. Strongly disagree

Circle the number which best fits the way you feel about the statement.

The following is a sample question and circled answered.

I like to attend Delta College (1) 2 3 4

	Strongly Agree	Agree	Disagree	Strongly Disagree
1. The weekly reading assignments were too long.	1	2	3	4
2. The reading assignments I understood.	1	2	3	4
3. I could get everything done that was expected of me.	1	2	3	4
4. My family or work responsibilities interfered with my studies.	1	2	3	4
5. I could understand what was required in the course.	1	2	3	4
6. I was able to put what I read into practice when it came to patient care.	1	2	3	4
7. I could remember what I had read.	1	2	3	4
8. I could follow directions which were told me.	1	2	3	4
9. I could work the math problems.	1	2	3	4
10. I was easily distracted by outside noises in the ATL.	1	2	3	4
11. I could make my hands do what I wanted them to do in the clinical laboratory.	1	2	3	4
12. I can tell by feeling if water or solutions would be too hot or too cold when doing baths or treatments for patients.	1	2	3	4
13. I was able to do the procedures after they were demonstrated in ATL.	1	2	3	4
14. I was able to "size up a load" when it came to getting things done in the clinical laboratory.	1	2	3	4

	Strongly Agree	Agree	Disagree	Strongly Disagree
15. I was able to put myself in the patient's place.	1	2	3	4
16. I become involved with the patients and their problems.	1	2	3	4
17. I am able to stick to the rules.	1	2	3	4
18. I could carry out the teacher's verbal directions.	1	2	3	4
19. I was able to role play or pretend.	1	2	3	4
20. I often spill things or am slow and clumsy.	1	2	3	4
21. I knew how far to stand from a patient or the instructor when talking to them.	1	2	3	4
22. I knew my own strengths and weaknesses.	1	2	3	4
23. Other students influenced what I did.	1	2	3	4
24. I could tell the difference between important and unimportant things in nursing care.	1	2	3	4
25. The instructor gave me enough time to think.	1	2	3	4
26. I had trouble with the multiple choice test items.	1	2	3	4
27. My instructor gave me enough direction so I knew what I should do.	1	2	3	4
28. I was able to decide what I should do in most situations.	1	2	3	4

	Strongly Agree	Agree	Disagree	Strongly Disagree
29. In most situations I could predict what would happen.	1	2	3	4
30. My instructor made reasonable assignments and demands.	1	2	3	4
31. My instructor understood me and my learning needs.	1	2	3	4
32. I could get everything done that was expected of me.	1	2	3	4
33. I enjoyed going to clinical laboratory.	1	2	3	4
34. I was constantly afraid of failure.	1	2	3	4
35. My instructor stimulated me to do my best.	1	2	3	4
36. Please select that which applies to you. Your age group				
1. _____	18 - 20			
2. _____	21 - 26			
3. _____	27 - 36			
4. _____	37 - 46			
5. _____	47 and over			

37. How many credits did you complete before you started the first nursing course?

1. _____ none
2. _____ 3 - 6
3. _____ 7 - 10
4. _____ 11- 14
5. _____ 15 and over

38. How many credit hours did you carry the first semester you were in nursing?

1. _____ 8
2. _____ 9 - 12
3. _____ 13 - 15
4. _____ 16 and over

39. How many hours do you work at a job for each week this semester?

1. _____ none
2. _____ 8 - 16
3. _____ 17 - 24
4. _____ 25 - 36
5. _____ 37 and over

COMMENTS:

NURSING STUDENT SURVEY
#032072A
CML

Please respond to the following statements about your nursing course this semester. Consider each item in view of your experience this semester. Use the following key for each statement:

1. Strongly agree
2. Agree
3. Disagree
4. Strongly disagree

1. My instructor understands me and my learning needs.
2. My instructor makes reasonable assignments and demands.
3. I enjoy going to the clinical laboratory.
4. In most situations I can predict what will happen.
5. I am able to decide what I should do in most situations.
6. My instructor gives me enough direction so I know what I should do.
7. I am constantly afraid of failure.
8. I have trouble with multiple choice test items.
9. My instructor gives me enough time to think.
10. I can tell the difference between important and unimportant things in nursing care.
11. I am influenced by what other students tell me.
12. I know my own strengths and weaknesses.
13. I usually know how far to stand from a patient or my instructor when talking to them.
14. I am able to role play or pretend.
15. I can carry out my instructor's overall directions.
16. I am able to stick to the rules.
17. I become involved with patients and their problems.
18. I am able to put myself in the patient's place.

19. I am able to "size up a load" when it comes to getting things done in the clinical laboratory.
20. I am able to do procedures after they are demonstrated in ATL.
21. I can tell by feeling if water or solutions would be too hot or too cold when doing baths or treatments for patients.
22. I can make my hands do what I want them to do in the clinical lab.
23. I am easily distracted by outside noises in ATL.
24. I can follow directions which are told to me.
25. I can remember what I have heard.
26. I am able to put into practice what I have read when it comes to patient care.
27. I understand what is required in this course.
28. My family or work responsibilities interfere with my studies.
29. I can get everything done that is expected of me.
30. I understand the reading assignments.
31. The weekly reading assignments are too long.
32. Course assignments and demands are reasonable.
33. I can work math problems.
34. My instructor stimulates me to do my best.
35. I enjoy working with my instructor.

36. Please select that which applies to you. Your age group.

- 1. _____ 18-20
- 2. _____ 21-26
- 3. _____ 27-36
- 4. _____ 37-46
- 5. _____ 47 and over

37. How many credits did you complete before you started the first nursing course?

- 1. _____ none
- 2. _____ 3-6
- 3. _____ 7-10
- 4. _____ 11-14
- 5. _____ 15 and over

38. How many credit hours did you carry the first semester you were in nursing?

- 1. _____ 8
- 2. _____ 9-12
- 3. _____ 13-15
- 4. _____ 16 and over

39. How many hours do you work at a job for pay each week this semester?

- 1. _____ none
- 2. _____ 8-16
- 3. _____ 17-24
- 4. _____ 25-36
- 5. _____ 37 and over

Comments:

APPENDIX D

NURSING FACULTY SURVEY

NURSING FACULTY SURVEY

Please respond to the following statements about your group of students this semester. Consider each item in view of your experience this semester. Use the following key for each statement:

1. Strongly agree
2. Agree
3. Disagree
4. Strongly disagree

1. I enjoy going to the clinical laboratory.
2. In most situations I can predict what will happen.
3. My students were able to tell the difference between important and unimportant things in nursing care by the end of the semester.
4. My students are able to carry out my overall directions.
5. I become involved with students and their problems.
6. I am able to put myself in the student's place.
7. My students are able to remember what I tell them.
8. My students understand what is required in this course.
9. The weekly reading assignments are too long.
10. Course assignments and demands are reasonable.
11. I find my students stimulating.
12. I enjoyed working with this group of students.
13. This group of students presented me with the usual amount of problems.
14. This group of students on the whole seemed compatible to each other.
15. On the whole this group of students seemed compatible to my teaching style.

16. Cognitive style matching is helpful to me as an instructor.
17. Cognitive style matching has not affected anything I did this semester.
18. I would favor cognitive style matching for all students and faculty.
19. Cognitive style matching should be continued.
20. This semester has been personally fulfilling.

Comments regarding cognitive style and cognitive style matching:

General Comments:

APPENDIX E

SUMMARY OF SELECTED REASONS
FOR SECTION TRANSFER

SUMMARY OF SELECTED REASONS FOR SECTION TRANSFER

"Conflict of time."

"I would like to stay with the same group of people. I'm also acquainted with the hospital I'd prefer, and where it is."

"I would like Friday afternoons free."

"Cannot afford gas or distance. Do not like snowy roads."

"I wish to change to this hospital because I think the training will be better there, and I would like a change."

"Convenience of time with consideration of my children and husband."

"I worked at the other hospital in lll and was uncomfortable about the atmosphere there."

"Convenience of obtaining a baby sitter."

"Because I have all pant uniforms and that hospital doesn't allow them."

"Need to be home when children come home from school. Transportation."

"I would like to be in a section in which I know at least one person. Also, I often go out of town on Friday afternoons."

"Section 02 would be more convenient because I would have Tuesday off and I work Tuesdays. I am earning my way through college so it is important that I work."

APPENDIX F

TREATMENT LESSON QUIZ AND
STUDENT REACTION FORM

G.T.L. 1V-C
Quiz
#041272

Matching: Select the best ~~or~~ most appropriate nursing action for each condition.

<u>Condition</u>	<u>Nursing Action</u>
1. Ulcerative Colitis	1. Teach patient proper body mechanics for lifting and pulling.
2. Hernia	2. Teach patient and family re-garding special gluten free diet.
3. Vaginal fistula	3. Tension centered on large colon; allow patient to talk out tensions.
4. Celiac Disease	4. Observe and measure output hourly. 5. Provide local cleanliness and irrigations.
5. Urinary Obstruction	1. Daily weight, restricted fluids.
6. Renal Calculi	2. Observe and measure hourly output.
7. Nephritis	3. Maintain patent (open) catheter post operative.
8. Prostatic Hypertrophy	4. Strain all urine, maintain fluid intake. 5. Observe for blood and mucus in the small stools.
9. Your newly admitted patient is complaining of abdominal pain at McBurney's point. Which one of the following nursing measures would be incorrect or wrong?	1. Apply cold compresses to the site. 2. Low fowler's position. 3. Administer prescribed pain medication. 4. No food or fluids by mouth. 5. Observe vital signs hourly.

10. The inability to excrete waste products through the kidney will be reflected in all of the following except:
 1. the patient's responses
 2. elevated blood urea nitrogen
 3. increased odor of urine from mouth and skin
 4. increase in blood hemoglobin
11. The minimum 24 hour urinary output necessary to maintain normal function is:
 1. 400 ml. or c.c.
 2. 1,300 ml. or c.c.
 3. 800 ml. or c.c.
 4. 200 ml. or c.c.
12. What is the normal urinary output in 24 hours?
 1. 400 c.c. to 500 c.c.
 2. 600 c.c. to 1000 c.c.
 3. 1200 c.c. to 1500 c.c.
 4. 1600 c.c. to 2000 c.c.
 5. 2200 c.c. to 3000 c.c.
13. When you are ambulating a patient with a retention catheter, what is the best nursing action?
 1. Clamp off the catheter, disconnect the drainage tubing, ambulate the patient.
 2. Allow the patient to sit in a chair close to the drainage setup.
 3. Keep the catheter and drainage tubing together and carry these with the ambulating patient.
 4. Clamp off the catheter, cover the catheter end with a sterile protector after it is disconnected from the drainage tubing, ambulate the patient.
14. The patient who has had a prostatectomy may have intermittent bladder irrigations. What will be the response of the bladder to a rapid filling with the irrigating solution?
 1. hemorrhage
 2. spasm
 3. atony
 4. increased capacity
 5. decreased capacity

15. Chemotherapy may be prescribed to slow down tumor growth. Which one of the following side effects would not be likely to happen?
 1. decreased white blood count
 2. alopecia
 3. abnormal bleeding
 4. increased red blood count
 5. diarrhea
16. Which one of the following states would not occur with diarrhea?
 1. fluid loss
 2. electrolytes lost
 3. decreased peristalsis
 4. circulatory failure
 5. weight loss
17. When output from the intestinal tract is decreased, what situations exist?
 1. constipation
 2. diarrhea
 3. renal obstruction
 4. circulatory overload
18. What is loss of voluntary control of bowel or bladder?
 1. constipation
 2. incontinence
 3. diarrhea
 4. fistula
 5. relaxed pelvic muscles
19. Which of the following nursing measures would be most important for the patient with a levine tube?
 1. maintain patency of the levine tube.
 2. offer frequent, small amounts of water.
 3. maintain flat position in bed.
 4. warm applications to the abdomen.
20. What is the major responsibility of the nurse in promoting renal elimination?
 1. administration of laxatives.
 2. administration of enemas.
 3. establishing a fixed routine.
 4. administration of fluids between 2,000 and 3,000 ml. daily.

G.T.L. 1V-C
#041272
CML

Name _____

Date _____

Section _____

Please complete the following reaction sheet.

My assignment for GTL 1V-C Part 1 was (please check)

_____ ATL

_____ Small group discussion

_____ Tutor in small group discussion

_____ Read only

Please respond to the following items in relation to:

- a) ease of learning
- b) amount of learning
- c) enjoyment of learning

The most helpful thing about this lesson was

The least helpful thing about this lesson was

In the future I would recommend

General Comments

APPENDIX G

BASELINE DATA

BASELINE DATA

GRADES ACHIEVED IN N211 (SECOND NURSING COURSE)

Year	Number	A	B	C	D	E/W
1969	151	30	68	39	2	12
1970	145	30	40	33	9	33
1971	172	40	54	34	7	37
1972 (Fall)	42	16	16	3	0	7
TOTALS	510	116	178	109	18	89
Percent		22	34	21	3	17

APPENDIX H

SUMMARY OF INCREASES AND DECREASES IN COGNITIVE STYLE ELEMENTS COMPARING TWO TESTINGS

SUMMARY OF INCREASES AND DECREASES IN COGNITIVE
STYLE ELEMENTS COMPARING TWO TESTINGS

	<u>INCREASES IN COGNITIVE STYLE ELEMENTS</u>	<u>DECREASES IN COGNITIVE STYLE ELEMENTS</u>	<u>TOTAL CHANGES</u>	
T (AL)	1	5	6	} 18
T (AQ)	3	0	3	
T (VL)	1	4	5	
T (VQ)	3	1	4	
Q (CEM)	0	0	0	} 25
Q (CES)	7	0	7	
Q (CET)	1	1	2	
Q (CH)	0	2	2	
Q (CK)	3	2	5	
Q (CKH)	2	0	2	
Q (CP)	2	0	2	
Q (CS)	1	1	2	
Q (CT)	3	0	3	
A	4	4	8	} 13
F	0	4	4	
I	0	1	1	
D	7	10	17	} 56
L	1	2	3	
M	1	6	7	
R	4	0	4	

APPENDIX I

ELEMENTS ABSENT FROM THE COGNITIVE STYLE OF
PASSING AND FAILING NURSING STUDENTS

ELEMENTS ABSENT FROM THE COGNITIVE STYLE OF
PASSING AND FAILING NURSING STUDENTS

Element	Pass n=96	Fail n=87
T(AL)	0	1
T(AQ)	18	27
T(VL)	7	21
T(VQ)	14	22
Q(CEM)	1	1
Q(CES)	4	9
Q(CET)	0	1
Q(CH)	26	23
Q(CK)	2	5
Q(CKH)	5	8
Q(CP)	0	1
Q(CS)	0	3
Q(CT)	0	0
A	3	2
F	0	1
I	0	0
D	2	0
L	21	22
M	3	1
R	0	0
(K)	15	30
Totals	121	178

APPENDIX J

SUMMARY OF CHANGES IN COGNITIVE STYLE ACCORDING TO INSTRUCTOR MATCHING FOR TWO TESTINGS

SUMMARY OF CHANGES IN COGNITIVE STYLE
ACCORDING TO INSTRUCTOR MATCHING

Match Points = 38

Instructor #1

STUDENT	<u>FIRST MATCHING COGNITIVE STYLE</u>			<u>SECOND MATCHING COGNITIVE STYLE</u>			<u>DIFFERENCE</u>
#1	28/38	.736842		30/38	.789473	+	.052631
2	24/38	.631578		26/38	.684210	+	.052632
3	29/38	.763157		30/38	.789473	+	.026316
4	28/38	.736842		33/38	.868421	+	.131579
5	32/38	.842105		32/38	.842105		_____
6	26/38	.631578		31/38	.815789	+	.184211

Instructor #2 Match Points = 36

STUDENT							
#1	31/36	.86111		29/36	.55555	-	.305556
2	28/36	.77777		31/36	.86111	+	.083340
3	29/36	.80555		31/36	.86111	+	.055560

Instructor #3 Match Points = 40

STUDENT							
#1	34/40	.94444		31/40	.86111	-	.083330
2	34/40	.94444		26/40	.72222	-	.0222220
3	25/40	.69444		33/40	.91666	+	.0222220
4	33/40	.91666		34/40	.94444	+	.027780
5	30/40	.83333		30/40	.83333		_____
6	28/40	.77777		26/40	.72222	-	.055550

TABULATION OF
CHANGES IN COGNITIVE STYLES
ELEMENTS FOR TWO TESTINGS

STUDENT	T (AL)	T (AQ)	T (VL)	T (VQ)	Q (CEM)	Q (CES)	Q (CET)	Q (CH)	Q (CK)	Q (CKH)	Q (CP)	Q (CS)	Q (CT)	A	F	I	D	L	M	R	(K)
#1-1	-48) +62) = 110 Total Change Points																				
Test #1	7	9	121	34	22	14	19	13	18	23	16	20	15	17	19	24	25	43	38	24	0
Test #2	7	10	105	36	24	16	20	15	20	24	20	22	22	18	16	26	34	32	18	46	2
Change -	0	+1	-14	+2	+2	+2	+1	+2	+2	+1	+4	+2	+7	+1	-3	+2	+9	-7	-20	+22	+2
#4-1	-24) +49) = 73 Total Change Points																				
	4	7	98	36	23	23	24	12	20	15	19	17	16	14	20	26	25	44	37	24	0
	5	10	110	34	23	23	23	10	18	19	16	22	22	12	20	28	22	44	28	36	4
Change -	+1	+3	+12	-2	0	0	-1	-2	-2	+4	-3	+5	+6	-2	0	+2	-3	0	-9	+12	+4
#1-2	-20) +32) = 52 Total Change Points																				
	8	8	111	26	21	9	17	14	20	17	19	16	14	13	22	25	36	50	18	26	0
	8	8	111	26	22	11	21	15	19	17	23	15	13	17	18	25	35	38	21	35	2
Change -	0	0	0	0	+1	+2	+4	+1	-1	0	+4	-1	-1	+4	-4	0	-1	-12	+3	+11	+2

APPENDIX K

SUMMARY OF READING LEVELS

READING LEVEL FOR NURSING STUDENTS
IN RELATION TO FINAL GRADES IN THE
NURSING COURSE

	A n=23	B n=36	C n=34	D n=4	W/E n=36	W/E n=54(first course)
2.0 - 2.9						1
3.0 - 3.9						6
4.0 - 4.9		4	3	1	8	15
5.0 - 5.9		2	3	0	6	9
6.0 - 6.9	4	7	9	0	31	7
7.0 - 7.9	5	6	6	0	21	8
8.0 - 8.9	2	4	1	1	11	3
9.0 - 9.9	2	1	2	2	3	2
10.0 -10.9	3	4	2	0	0	1
11.0 -11.9	6	7	8	0	5	2
12.0 -12.9	1	1	0	0	0	0

APPENDIX L

ELEMENTS MISSING IN COGNITIVE STYLE ACCORDING
TO FINAL COURSE GRADES IN NURSING

ELEMENTS MISSING IN COGNITIVE STYLE ACCORDING
TO FINAL COURSE GRADES IN NURSING

Element	A n=23	B n=36	C n=34	W/E n=36
T(AL)	0	0	0	0
T(AQ)	4	6	7	10
T(VL)	0	2	5	5
T(VQ)	2	6	6	9
Q(CEM)	0	0	2	0
Q(CES)	0	1	2	2
Q(CET)	0	0	0	0
Q(CH)	7	7	12	7
Q(CK)	2	1	0	0
Q(CKH)	0	0	4	4
Q(CP)	0	0	0	0
Q(CS)	0	0	0	0
Q(CT)	0	0	0	0
A	2	0	1	0
F	0	0	0	0
I	0	0	0	0
D	1	0	1	0
L	1	7	12	9
M	2	1	1	0
R	0	0	0	0
(K)	<u>2</u>	<u>7</u>	<u>6</u>	<u>9</u>
Totals	23	38	59	55

APPENDIX M

CHANGES IN STUDENT'S COGNITIVE STYLE MAPS
IN RELATION TO LAST INSTRUCTOR

CHANGES IN STUDENT'S COGNITIVE STYLE MAPS
IN RELATION TO LAST INSTRUCTOR

S. student	Matching Points	Theoretical Symbols				Qualitative Symbols								Cultural Determinants				Modalities of Inference			
		(AL)	(AQ)	(VL)	(VQ)	(CEM)	(CES)	(CET)	(CH)	(CK)	(CKH)	(CP)	(CS)	(CF)	A	F	I	D	L	M	R
Instructor #1=	38	2	2	3	2	3	3	2	2	2	2	3	3	3	2	2	3	2	0	2	3
28/38	(28)	3	3	3	3	3	2	3	2	3	3	3	3	2	2	2	3	2	3	3	2
-1	30/38	3	2	3	3	3	+1	3	2	3	3	3	3	+1	2	2	3	2	2	0	3
D=																			-1	-3	+1
24/38		3	3	3	3	3	2	3	2	3	3	3	3	2	0	3	3	2	3	0	2
26/38		3	3	3	3	3	2	3	2	3	3	3	-1	2	+2	-1	3	2	3	0	2
D=																					
29/39		3	2	3	3	3	0	3	3	3	3	3	3	3	2	2	3	2	3	2	2
30/38		3	2	-1	3	3	+3	3	3	3	3	3	3	3	2	2	3	0	3	2	2
D=																					
28/38		3	3	3	3	3	3	3	2	2	3	2	3	3	0	2	3	2	0	3	2
33/38		3	3	2	2	3	3	3	2	2	3	+1	3	3	2	2	3	2	0	2	3
D=																				-1	+1
32/38		3	2	3	3	3	3	3	2	3	3	3	3	3	2	2	3	2	3	2	2
32/38		3	3	3	3	3	3	3	2	3	3	3	3	3	2	2	3	2	3	2	2
D=																					
26/38		2	2	3	2	3	2	3	2	3	3	2	3	3	0	3	3	0	3	3	2
31/38		2	2	2	2	3	3	3	2	3	3	+1	3	3	0	2	3	2	3	2	2
D=																				-1	
Instructor #2=36	2	0	3	0	3	3	3	3	2	3	3	3	3	2	2	3	3	2	3	3	3
31/36	(31)	2	3	3	2	3	2	3	2	2	2	3	3	3	2	2	3	2	2	3	2
29/36	(29)	2	3	3	3	3	+1	3	2	3	2	3	3	3	2	2	3	0	2	3	2
D=																					
-1							+1								-2						

SUMMARY OF CHANGES IN COGNITIVE
STYLE MAPS FOR SIX STUDENTS
WITH INSTRUCTOR #1

- 1 change Major T(AL) to minor t(al): Theoretical Auditory
Linguistic
- 3 change Major T(VL) to minor t(vl): Theoretical Verbal
Linguistic
- 1 change minor q(ces) to Major Q(CES): Qualitative Code
Esthetics
- 1 change negligible q(ces) to Major Q(CES): Qualitative
Code Esthetics
- 2 change minor q(cp) to Major Q(CP): Qualitative Code Proxemics
- 1 change Major Q(CS) to minor q(cs): Qualitative Code Synoetics
- 1 change minor q(ct) to Major Q(CT): Qualitative Code
Transactional
- 2 change negligible A to minor a: Associates
- 2 change Major F to minor f: Family
- 1 change Major D to negligible: Differences
- 1 change negligible D to Major D: Differences
- 1 change Major M to negligible: Magnitudes
- 2 change Major M to minor m: Magnitudes
- 2 change minor r to Major R: Relationships

Total Changes:

- 4 changes in Theoretical Elements
- 6 changes in Qualitative Codes
- 4 changes in Cultural Determinants
- 8 changes in Modalities of Inference

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