EVALUATION OF CRITICAL THINKING SKILLS IN AN ASSOCIATE DEGREE NURSING PROGRAM

by

JACKIE HASTINGS JONES

(Under the Direction of Libby V. Morris)

ABSTRACT

Nurses function in a complex, rapid-paced environment. The healthcare industry is characterized by continuous technological growth, constant change, unremitting expansion, with new knowledge and treatments emerging on an on-going basis. Critical thinking skills are essential for nurses to function as needed in this environment and to survive and evolve in a profession whose field of knowledge is never stagnant and professional numbers never sufficient.

The purpose of this study was to examine changes in critical thinking skills in an associate degree nursing program, to determine if a relationship exists between critical thinking scores and specified measures of academic success, and to determine if a relationship exists between critical thinking scores and student variables of high school GPA, SAT scores, or age.

This research was conducted at a small liberal arts college and university located in the state of Georgia. The participants in this longitudinal study were a convenience sample of the associate degree students entering a nursing program in the fall of 2002. It was conducted over a two year period and utilized a pretest/posttest design.

Data were collected from the students’ records and from scores obtained from administration of the pretest and posttest Critical Thinking Assessments (CTAs). Descriptive
statistics, matched pair t-tests, a two sample t-test, correlation analysis, and several simple linear regression analyses were conducted. No significant changes between pretest and posttest CTAs were noted. Statistically significant correlations were found between pretest CTA and matriculation time and GPA of nursing coursework; however, no correlation was found with end-program GPA. Pretest CTA correlated positively with SAT-math and negatively with age. The most significant finding of this study is the relationship between critical thinking skills and academic success in nursing.

Recommendations for further studies include identification of specific teaching strategies that promote the development of critical thinking skills, faculty preparedness to teach critical thinking skills, additional studies involving associate degree nursing students, and additional longitudinal studies using nursing-specific definitions of critical thinking.

INDEX WORDS: Critical thinking, Critical thinking skills, Nursing education, Higher education.
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NURSING PROGRAM

by

JACKIE HASTINGS JONES

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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Acknowledgements</th>
<th>iv</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of Tables</td>
<td>ix</td>
</tr>
<tr>
<td><strong>Chapter</strong></td>
<td></td>
</tr>
<tr>
<td>1. Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Introduction and Background</td>
<td>1</td>
</tr>
<tr>
<td>Nursing Practice Today</td>
<td>2</td>
</tr>
<tr>
<td>Nursing Practice and Critical Thinking</td>
<td>5</td>
</tr>
<tr>
<td>Purpose Statement</td>
<td>7</td>
</tr>
<tr>
<td>The Nursing Curriculum and Critical Thinking</td>
<td>7</td>
</tr>
<tr>
<td>Study Design</td>
<td>9</td>
</tr>
<tr>
<td>Research Questions</td>
<td>11</td>
</tr>
<tr>
<td>Significance of the Study</td>
<td>12</td>
</tr>
<tr>
<td>Organization of the Dissertation</td>
<td>13</td>
</tr>
<tr>
<td>2. Review of the Literature</td>
<td>15</td>
</tr>
<tr>
<td>History of Critical Thinking</td>
<td>15</td>
</tr>
<tr>
<td>Definitions of Critical Thinking</td>
<td>18</td>
</tr>
<tr>
<td>Critical Thinking Instruments</td>
<td>22</td>
</tr>
<tr>
<td>Research Studies of Critical Thinking in Nursing</td>
<td>25</td>
</tr>
</tbody>
</table>
Relationship of Critical Thinking to Achievement in Nursing

Education.................................................................................. 36
Relationship of Critical Thinking to Other Related Variables........ 37
Summary.................................................................................... 38

3. METHODOLOGY........................................................................ 39

Setting....................................................................................... 39
Research Questions...................................................................... 40
Research Design........................................................................ 40
Description of the Sample....................................................... 41
Instrumentation........................................................................ 41
Overview of Critical Thinking Strategies and Assessment......... 44
Student Consent........................................................................ 46
Data Collection Procedure....................................................... 47
Data Analysis........................................................................... 48
Definition of Terms................................................................... 49
Summary.................................................................................... 50

4. RESULTS..................................................................................52

Analysis of Research Questions.............................................. 53
Summary.................................................................................... 61

5. CONCLUSIONS AND RECOMMENDATIONS..........................62

Overview................................................................................... 62
Interpretation of Results.......................................................... 63
Limitations of the Study......................................................... 71
Implication for Nursing Education..............................................72
Recommendations for Further Research...............................73
Summary...............................................................................74
REFERENCES........................................................................76
APPENDICES.......................................................................86

A ASSOCIATE DEGREE CURRICULUM PLAN AND PLAN
   OF STUDY........................................................................86
B THE DELPHI STUDY, DEFINITION OF SUBSKILLS.............89
C ASSESSMENT TECHNOLOGIES INSTITUTE, CRITICAL
   THINKING ASSESSMENT.................................................93
D INFORMATION SHEET FOR STUDENT PARTICIPATION AND
   CONSENT FORM..........................................................100
E INSTITUTIONAL REVIEW BOARD APPROVAL, UNIVERSITY
   OF GEORGIA...............................................................103
F INSTITUTIONAL REVIEW BOARD APPROVAL, NORTH
   GEORGIA COLLEGE AND STATE UNIVERSITY.............105
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1</td>
<td>Demographics of Study Participants</td>
<td>42</td>
</tr>
<tr>
<td>Table 2</td>
<td>Descriptive Statistics for Study Participants</td>
<td>54</td>
</tr>
<tr>
<td>Table 3</td>
<td>Difference in Mean Composite Scores from Entry to Program Completion</td>
<td>55</td>
</tr>
<tr>
<td>Table 4</td>
<td>Difference in Subset Mean Scores from Entry to Program Completion</td>
<td>56</td>
</tr>
<tr>
<td>Table 5</td>
<td>CTA1 Scores based on Matriculation Time</td>
<td>57</td>
</tr>
<tr>
<td>Table 6</td>
<td>Correlation of CTA1, CTA2, and End-Program GPA</td>
<td>59</td>
</tr>
<tr>
<td>Table 7</td>
<td>Regression Analysis Summary</td>
<td>60</td>
</tr>
</tbody>
</table>
CHAPTER 1
INTRODUCTION
Introduction and Background

Nurses function in an ever-changing, rapid-paced environment. In clinical settings, nurses are frequently confronted with an array of complex, unique, and high-stake patient care situations. Oftentimes, these situations require patient care decisions to be made quickly with insufficient information with multiple, multidimensional possible approaches to treatment and numerous possible patient responses to treatment. In the past, a primary focus of nursing education was teaching concrete nursing skills. However, this approach to nursing education is problematic as knowledge and skills gained during nursing school become outdated within a few years. A paradigm shift in nursing education is in process, bringing with it a growing recognition that nurses, hence nursing students, must be taught critical thinking skills; they must be taught how to think, not what to think (Simpson & Courtney, 2002; Daly, 1998; Miller & Malcolm, 1990; Rane-Szostak & Robertson, 1996).

This educational shift has occurred largely in response to the changing healthcare environment. Healthcare is an industry characterized by continuous technological expansion with new knowledge and treatments emerging on a continuous basis. It is an industry marked by constant change, rapid growth and development; and, as our population ages, with the concomitant increase in acute, chronic, and complex disease processes, this expansion will continue. Along with this, the healthcare industry is also confronted with escalating demands for
quality care and, at the same time, cost containment (Morris, 1987). All this places additional demands on nurses as a primary provider of care.

Nursing Practice Today

Nurses are the primary provider of care to patients and are a vital part of the healthcare delivery system. According to data from the U. S. Department of Labor, Bureau of Labor Statistics (2002), nurses comprise the largest healthcare occupation, with approximately 2.2 million jobs in 2000. Continued growth and job opportunities are predicted to be excellent with employment rates growing faster than the average for other occupations. Nurses work in a wide variety of healthcare settings, including hospitals, doctors’ offices and clinics, nursing homes, home health agencies, public health, occupational health, and schools. Within these settings, they provide a vast array of services including, but not limited to, direct patient care, supervising and managing patient care, health education, health counseling, physical examinations, health promotion, intensive care, emergency trauma care, administering medications, dialysis, phlebotomy, IV therapy, and a variety of administrative positions. Advanced practice nurses, working with physicians, oftentimes provide primary healthcare, including the diagnosing and treatment of illnesses and injuries. Many states allow these advanced practice nurses prescriptive authority, which allows them to prescribe medications.

Because nursing is such an integral part of the healthcare system, challenges and changes in the healthcare system also have an impact on the profession of nursing. The National League for Nursing (2000) identified 10 trends which significantly affect the delivery of healthcare and nursing practice. These are:

1. Focus on Wellness: Healthcare is shifting focus from a disease treatment outlook to one on health promotion and disease prevention;
2. Focus on Management of Chronic Conditions: Better management of the increasing numbers of chronic conditions with an increased emphasis on preventing complications. This will increase the life expectancy for many Americans suffering with chronic diseases;

3. Consumer Empowerment: Greater involvement by healthcare consumers, including decision-making and also provision of care;

4. Shift of Care into the Community: More care being provided in the community, including the home.

5. Aging Population: As medical knowledge and treatment improves, life expectancy increases. The American population is aging, which creates an increase in chronic and/or acute illnesses, and greater need for long-term care options;

6. Increasing Cultural Diversity: Greater cultural diversity in both the patient population and healthcare worker is being experienced.

7. Emphasis on Fiscal Accountability: The public expects/demands quality healthcare in as cost-effective a manner as possible;

8. Focus on Professional and Personal Accountability: Greater accountability, both for the individual and for the organization is expected;

9. Emphasis on Collaboration: Healthcare disciplines are expected to work together to ensure the optimal success of patient outcomes;

10. Expansion of Scientific Knowledge and Technology: New technologies and scientific knowledge dramatically alter, on an on-going basis, the prevention, diagnosis, and treatment of disease.
Another significant factor that has an impact on healthcare and nursing practice is the shortage of nurses. Of the challenges confronting the healthcare industry in the United States, the nursing shortage is one of the most pervasive and threatening to the welfare of its citizenry. A nationwide shortage of both nurses and nursing faculty exists. The National Advisory Council on Nurse Education and Practice (1996) projects that there will be 114,000 job vacancies nationwide for full-time equivalent registered nurses (RNs) in 2015. All areas of healthcare, including acute care facilities, long-term care facilities, clinics, and doctors’ offices will need RNs and the lack of sufficiently trained healthcare personnel will have detrimental effects on patient care and the healthcare industry (Morris, 1992).

The current nursing shortage is expected to be deeper and longer-lasting than previous shortages (Heller, Oros, & Durney-Crowley, 2001) and, in fact, is predicted to worsen in the coming decades. Nationwide, this shortage was recently addressed in a joint publication by the American Association of Colleges of Nursing, the American Nurses Association, the American Organization of Nurse Executives, and the National League for Nursing, titled “Strategies to Reverse the New Nursing Shortage” (2002). Although the report does not quantify the size of the nursing shortage, the report does state that “there is a growing realization that the supply of appropriately prepared nurses is inadequate to meet the needs of a diverse population—and that this shortfall will grow more serious over the next 20 years” (p. 1).

Further compounding this problem is the fact that there is insufficient classroom space, a growing scarcity of clinical training sites, and high attrition in nursing programs. At the school under study there were approximately 500 applicants for 120 spaces in the fall semester of 2002. This inability to accept qualified applicants is not unique to this institution’s nursing program. According to the American Association of Colleges of Nursing (2005), nationwide 32,797
qualified applicants were turned away at schools of nursing last year. The most commonly cited reasons given were insufficient number of faculty, insufficient clinical teaching space, and budget constraints. Competition for clinical training sites is fierce with schools of nursing competing to place too many students in too few clinical spots. Plus, attrition rates in nursing programs are high, which ultimately cause an inefficient diversion of valuable resources (Wells, 2003; Catalano & Eddy, 1993).

It is clear that just as the healthcare system is challenged to meet the needs of its citizenry in the 21st century, so is the profession of nursing. The nurse of the 21st century must be prepared to take on new and expanded roles, to function in a variety of environments, and to survive and evolve in a profession whose field of knowledge is never stagnant and professional numbers never sufficient. Critical thinking skills are essential for nurses to function as needed in this environment.

Nursing Practice and Critical Thinking

A nursing student can become a registered nurse via three different types of educational programs: the diploma, a 3-year program, usually hospital-based; an associate degree in nursing, involving 2 or 3 years of study and oftentimes located in a community or technical college; and, the 4-year baccalaureate degree in nursing (U. S. Department of Labor, 2002). Diploma programs, at one time a primary educational path for registered nurses, have diminished in importance and prevalence over the past 20 years and there are few diploma programs still functioning in the United States. Approximately one-half of the registered nursing programs in the United States provide associate degrees and the remaining are baccalaureate programs. Upon completion of a program of study, the nursing student must take and pass a National Council
Licensure Examination (NCLEX). Only after the successful completion of both the program of study and the NCLEX is the student licensed and allowed to practice as a registered nurse.

The need for critical thinking skills prevails throughout the multiple educational paths to becoming a registered nurse. Critical thinking has been identified by numerous groups as essential to the practice of nursing (Heller, Oros, & Durney-Crowley, 2001; Daggett & Butts, 2002). The ability to “demonstrate critical thinking, reflection, and problem-solving skills” has been identified as one of the twenty-one competencies needed by healthcare workers of the twenty-first century by the Pew Health Professions Commission (1998, p. vii) and as one of the core competencies for practitioners of the next decade by the National League for Nursing (2002a). In agreement, the American Association of Colleges of Nursing (2002) considers critical thinking one of the essential cognitive abilities for nurses of the 21st century.

Critical thinking skills enable the nurse to grow and evolve with the healthcare system. However, the most commonly cited justification for the need for critical thinking skills in nursing is its contribution to clinical competence. Nursing researchers almost universally accept that a linkage between critical thinking skills and clinical competence exists (Oermann, 1999; Edwards, 2003; Facione, Facione, & Sanchez, 1994; Daly, 2001; Kataoka-Yahiro & Saylor, 1994). It is proposed that critical thinking guides the day-to-day clinical decision-making of nurses. Miller and Malcolm (1990) contend that:

Nurses need finely honed critical thinking skills in order to be safe, competent, and skillful practitioners of their profession….They are expected to arrive at decisions that are individualized to the particular circumstances of each client…Rapidly deteriorating client physiology and environmental chaos compress the time available for contemplation but still demand critical thinking skills for a positive client outcome. (p. 67)

In fact, both nursing educators and health care administrators frequently cite critical thinking skills as one of the most desirable and important professional attributes a nurse should possess (Pardue, 1987; Vaughan-Wrobel, O’Sullivan, & Smith, 1997; Miller & Malcolm;
Sullivan, 1987; May, Edell, Butell, Doughty, & Langford, 1999; Spelic et al., 2001; Dexter et al., 1997). In her survey of 117 nurse educators, 82 nurse administrators, 23 recent baccalaureate of science in nursing (BSN) graduates, 96 experienced BSN graduates, and 11 deans or directors of nursing programs, King (1998) found that critical thinking was listed most frequently as the most important entry-level competency, yet critical thinking was consistently ranked among the lowest of observed competencies.

A widespread consensus across nursing practice literature that critical thinking skills are essential for nurses both to function in their chosen field and to have the ability to evolve as the profession and healthcare changes exists. Ultimately, the primary recipient of benefit is the healthcare consumer as critical thinking skills will aid in the “delivery of safe, comprehensive, individualized, effective and innovative care which stems from the competent clinical judgment of thinking professionals” (Facione, 1995).

Purpose Statement

The purpose of this study was to examine changes in critical thinking in an associate degree nursing program, to determine if a relationship exists between critical thinking scores and specified measures of academic success, and to determine if a relationship exists between critical thinking scores and student variables of high school GPA, SAT scores, or age.

The Nursing Curriculum and Critical Thinking

As the practice of nursing evolves in conjunction with the changing healthcare environment, nursing education needs to pave the way and prepare future practitioners for those changes. The teaching of critical thinking skills is part of this effort. In 1989, the National League for Nursing (NLN), an accrediting agency for nursing education programs, mandated that critical thinking be included in baccalaureate and higher programs of nursing education. It has
since required the teaching of critical thinking skills regardless of the type of educational program. In establishing the educational competencies for graduates of associate degree nursing programs, the NLN (2000) identified a number of “Assumptions for Nursing Education” which form a foundation for the core competencies. Among these assumptions is “Critical thinking skills will be essential” (p. 13). The Council of Associate Degree Programs (1990), a task force for the NLN, indicated in its report, “Educational Outcomes of Associate Degree Nursing Programs: Roles and Competencies”, that the primary role of the associate degree nurse is to provide direct patient care and further that, “The practice of a graduate from an associate degree nursing program is characterized by critical thinking, clinical competence, accountability, and a commitment to the value of caring” (p. 3). This position was reiterated in its subsequent report in 2000 (NLN, 2000).

Other leading nursing organizations have also recognized the relevance of critical thinking to the profession of nursing and the compelling need to teach nursing students critical thinking skills. In the report, “Nursing Education’s Agenda for the 21st Century”, the American Association of Colleges of Nursing (2002) identified critical thinking as one of the essential cognitive skills needed by nursing students. Critical thinking is considered to be an important measure of program quality and effectiveness and it is the expectation that the nursing curriculum increase critical thinking abilities.

As early as 1992, the NLN required that the assessment of critical thinking skills be included in the assessment and accrediting of nursing programs. For accreditation purposes, it required programs of nursing not only to teach critical thinking, but to define critical thinking, measure their effectiveness in teaching it, and then to revise their curriculum as necessary. The NLN (2002b) contends that the future of nursing education requires “reform and innovation in
schools of nursing” and “evaluation of teaching and learning outcomes” (p. 2) in the report, “Nursing Education Research Priorities”. This position is supported by the American Association of Colleges of Nursing in their mandate that the evaluation plans of educational institutions should include some measurement of outcomes that demonstrate the critical thinking skills of students (AACN, 2002).

Programs of nursing struggle with the implementation of outcome measurement requirements (Leppa, 1997). As compelling as the need is to teach critical thinking skills, assessing them is problematic and entails overcoming numerous obstacles (Simpson & Courtney, 2002). In order to integrate critical thinking and outcome measurement into nursing curricula, programs of nursing must first resolve issues of definition which is difficult due to the abstractness of the concept. Additionally, many other issues must be identified and dealt with prior to successful assessment of critical thinking: for example measurement instruments which are not nursing specific, determining how and when to measure, and considering the impact of maturation. The task of teaching and assessing for critical thinking skills may be difficult; however, critical thinking skills are so crucial to the profession of nursing, a means to accomplish this task must be found.

Study Design

This study was conducted at a small state supported co-educational liberal arts college and university in the State of Georgia. This institution was founded as an agricultural and mechanical college for both men and women in 1873. It is a senior unit of the University System of Georgia and operates under the direction of the Georgia State Board of Regents (NGCSU, 2003b).
Nursing as an academic field of study began at this institution in 1974 with the Associate of Science in Nursing (ASN) program. The university expanded its offerings in 1985 with the establishment of an LPN-RN Mobility program which allowed licensed practical nurses to validate their nursing knowledge in a transition course and then join the second year of the ASN program. Another expansion occurred in 1987 with the admission of the first class of baccalaureate nursing students. In 1998, the university received approval and began its first Masters of Science/Family Nurse Practitioner Program (NGCSU, 2003b).

The ASN program has full approval by the State of Georgia Board of Nursing. The program received accreditation from the National League for Nursing in 1980 and has maintained it thereafter (NGCSU, 2003b). Upon completion of the program, students are eligible to take the National Council Licensure Examination (NCLEX-RN) and after successful passage of this exam are licensed by the State of Georgia and allowed to practice as a registered nurse.

Admission to the program requires a composite Scholastic Aptitude Test (SAT) score of 800 or higher with a minimum of 400 in verbal and math areas and a predicted freshman grade point average of 2.5 or higher (NGCSU, 2002). The ASN degree requires successful completion of 70 semester hours: 22 semester hours of general education coursework, 15 semester hours of nursing major support courses, and 33 semester hours in nursing science. Of the 33 semester hours in nursing science, 13 are considered to be first year classes and 20 are designated second year classes (see Appendix A for nursing curriculum requirements).

It is recommended but not mandatory that students complete all the general education and support courses prior to beginning the nursing coursework. Depending upon the amount of
coursework completed, students enter the nursing program classified as either a sophomore or junior. Nursing coursework is designed to be completed in two academic years.

All nursing classes, except Nutrition and Growth & Development, integrate experiential learning into academic experience, primarily via clinical experiences. Clinical experiences include learning labs and supervised practice in a variety of health care settings, such as acute care facilities, doctors’ offices, health departments, and pre- and post-conference discussions.

This study has examined the critical thinking skills of students who entered the study institution’s associate degree in nursing program in the fall of 2002 and finished in the spring of 2004. This study used Astin’s (2002) input-environment outcome model of assessment which considers pretest data to be the input, posttest data to be the output, and any difference attributable, to a large extent, to the environment. The students were administered a critical thinking assessment during their first semester of the nursing program and again upon conclusion of the nursing program. This study focused on the results of this assessment and their relationship to program completion, age, scholastic aptitude tests, high school grade point average (GPA), nursing course GPA, end-program (GPA), and matriculation time.

Research Questions

This study addressed six research questions:

1. How do students’ scores differ on the composite critical thinking score at entry and at program completion in a selected population of students completing an associate degree nursing program?

2. How do students’ scores differ on the six subsets of analysis, evaluation, explanation, inference, interpretation, and self-regulation at entry and upon program completion?
3. Is there a difference between entry critical thinking scores for those students who matriculated on a full-time basis in the nursing program and those who did not?

4. What are the observed relationships, if any, between entry critical thinking scores and GPA for nursing courses completed?

5. What are the observed relationships, if any, between entry critical thinking scores, program completion critical thinking scores, and end-program grade point average?

6. Can student background variables of high school GPA, SAT-Math scores, SAT-Verbal scores, or age predict critical thinking scores?

Significance of the Study

This study has practical significance to this program and to the profession of nursing. Critical thinking skills are essential for the safe practice and future of nursing. Integrating both the teaching and assessment of critical thinking skills into the nursing curriculum has been mandated by the NLN. The findings of this study will allow this institution to reflect on the instructional strategies designed to teach critical thinking and their effectiveness. Currently, critical thinking strategies are woven throughout the curriculum. If these threaded strategies are not effective, this program of nursing will need to re-examine its curriculum and conduct further studies to determine what changes are needed and where to teach these essential skills.

Secondly, this study seeks to discover whether a relationship exists between critical thinking scores and end-of-program or cumulative GPAs and other specified student variables and between pretest critical thinking scores and other measures of academic success. If critical thinking is discovered to relate significantly to academic success, the critical thinking assessment could be used as either a pre-screening tool for admission or for early identification of students who have remediation needs. Utilizing the critical thinking assessment in this way has the
potential to positively affect the nursing shortage either by making sure that the students admitted are those with the greatest likelihood of success or that those who are admitted have been given every opportunity to succeed through early remediation identification.

The challenges created by the healthcare crisis and the nursing shortage place a grave responsibility on schools of nursing to utilize their limited resources as efficiently and effectively as possible. Significantly more students apply for entry into nursing programs than there are places for them. Attrition rates are high. Because classroom and clinical spaces are so limited, everything that can be done must be done to reduce current levels of attrition and ensure the success of the students that are accepted into nursing program. By optimizing the potential for programmatic success, the information garnered from this research has the potential to aid in the accomplishment of these goals.

Organization of the Dissertation

This research study is divided into five chapters. Chapter One has presented an introduction to the problem. It presented information about nursing practice, nursing education, and nursing curriculum and the importance of critical thinking in each of these venues. Further, it introduced the purpose of the research and research questions. Lastly, it explained the significance of the study.

Chapter Two of this dissertation provides a literature review of key elements of this study. Included are a history of critical thinking, definitions of critical thinking, instruments used to measure critical thinking, and empiric studies of critical thinking in nursing.

Chapter Three provides the methodology utilized in this study. Included are the research design, setting, sample description, instruments, student consent, data collection procedure,
critical thinking strategies and assessments currently utilized at the study institution, definitions of terms, and data analyses.

Chapter Four presents the results of the research. Data analysis for each of the research questions is described. The results of the statistical analyses are presented. Chapter 5 presents the conclusions and recommendations, including interpretation of results, implications for nursing education, limitations of the study, and recommendations for further research.
CHAPTER 2
REVIEW OF THE LITERATURE

This chapter provides a brief description of the introduction and evolution of critical thinking in the educational arena. Further, it provides various definitions of critical thinking currently in use and instruments used to measure critical thinking. Finally, empirical research on critical thinking in nursing is described and evaluated.

History of Critical Thinking

While the concept of critical thinking dates back to Greek philosophers such as Socrates, Plato, and Aristotle (Paul, 1990), John Dewey is generally considered to be one of the earliest proponents of critical thinking in the United States (Simpson & Courtney, 2002; Jones & Brown, 1991; Ennis, 1993). Dewey (1933) introduced the concept of reflective thinking in the early part of the 20th Century. Reflective thinking is similar to and contains many of components currently associated with the critical thinking process. He purported that reflective thinking included active and careful consideration of the genesis and logic of thoughts, ideas, or forms of knowledge and an awareness of subsequent conclusions derived from thoughts, ideas, or forms of knowledge. Reflective thought involves both a perplexity, doubt, or mental difficulty and a resulting search for resolution of the perplexity. “Demand for the solution of a perplexity is the steadying and guiding factor in the entire process of reflection” (Dewey, 1933, p. 14).

Reflective thinking, according to Dewey (1933), has five phases. The first phase is suggestion. It involves gathering information about the problem and spontaneous suggestions for problem resolution. The second phase is intellectualization which includes intellectual
refinement of the problem and further development of problem resolutions. The third phase is the guiding idea or hypothesis. This involves scrutinizing the problem and developing solutions to it with awareness that ongoing modification may be necessary. The fourth phase is reasoning in a narrow sense and includes analyzing and synthesizing the various components of the problem and available solutions. The fifth phase is testing the hypothesis by action. This phase seeks to determine whether the action decided upon during the reasoning phase works. In espousing thinking to be an educational aim, Dewey states “By putting the consequences of different ways and lines of action before the mind, it enables us to know what we are about when we act. It converts action that is merely appetitive, blind, and impulsive into intelligent action” (p. 17).

The first major research assessment of critical thinking in higher education began in 1951 with a study done by the Cooperative Study of Evaluation in General Education (Dressel & Mayhew, 1954). Sponsored by the American Council on Education, 1,752 students from 11 different colleges and universities were pretested and posttested with an instrument developed specifically to measure critical thinking. All 11 universities showed a mean gain from pretest to posttest over a year’s time.

Another landmark in the development of critical thinking was the development of Bloom’s taxonomy of educational objectives. Published in 1956 (Bloom, Englehart, Furst, Hill, & Krathwohl, 1956), this taxonomy identified three domains of learning: cognitive, psychomotor, and affective. Within the cognitive domain, a hierarchical listing of intellectual abilities was identified: knowledge, comprehension, application, analysis, synthesis, and evaluation. The top three categories of this domain, analysis, synthesis, and evaluation, are generally considered higher order thinking and indicative of critical thinking. In explaining the
development of this taxonomy, Bloom stated, “Whatever the case in the past, it is very clear that in the middle of the 20^{th} century we find ourselves in a rapidly changing and unpredictable culture….Under these conditions, much emphasis must be placed in the schools on the development of generalized ways of attacking problems and on knowledge which can be applied to a wide range of new situations” (p. 40). Even though Bloom’s taxonomy is considered indicative of critical thinking, there are critics who believe it to be too limited in understanding the essence of critical thinking (Paul, 1985).

The belief that critical thinking is a legitimate goal of education has been around since John Dewey (1933). Broadening this goal, the National Education Association’s Educational Policies Commission (1961) supported the idea and stated, “The purpose which runs through and strengthens all other educational purposes—the common thread of education—is the development of the ability to think” (p. 12). In today’s education arena, there is consensus among educators that critical thinking is of crucial importance and, in fact, Stark and Lattuca (1997) identified this as the most commonly espoused purpose of education cited by educators.

The acknowledgement that critical thinking is important is recognized not only by educators, but also by many governmental officials as an important national education goal. Governor Bill Clinton of Arkansas was one of the first to propose critical thinking as a national education goal. He led the way for inclusion of critical thinking into the National Governors’ Association’s recommendation for national educational goals in the 1980s (Facione, 1995). In 1990, six goals for education were identified by the President of the United States and state governors to be achieved by the year 2000. The fifth objective of the fifth goal recommends that “the proportion of college graduates who demonstrate an advanced ability to think critically,
communicate effectively, and solve problems will increase substantially” (U. S. Department of Education, 1995, p. 1).

Perhaps Richard Paul (1990), founder of the Center for Critical Thinking and the National Academy on Critical Thinking, Director of Research of the Center for Critical Thinking, and Chair of the National Council for Excellence in Critical Thinking, established the need for critical thinking in the simplest and clearest fashion:

Because we do not come to our experience with a blank slate for a mind, because our thinking is already, at any given moment, moving in a direction, because we can form new ideas, beliefs, and patterns of thought only through the scaffolding of our previously formed thought, it is essential that we learn to think critically in environments in which a variety of competing ideas are taken seriously. (p. xv)

Readily adopting the mandate to teach critical thinking skills, the National League for Nursing began requiring baccalaureate and higher degree nursing educational programs to include the teaching of critical thinking skills to its students in 1989. Soon recognizing the relevance of critical thinking to the practice of nursing, the NLN added this requirement to all nursing degree programs.

Definitions of Critical Thinking

Critical thinking is an abstract concept. This abstractness has led to a multitude of definitions and an absence of terminological precision. In fact, Beyer (1987) stated, "The term critical thinking is one of the most abused terms in our thinking skills vocabulary. Generally, it means whatever its users stipulate it to mean” (p. 32). Many of the more commonly utilized definitions of critical thinking originate in the areas of philosophy or psychology. Presented below are definitions of critical thinking as proposed by current leaders in critical thinking, contextual definitions specific to nursing, and those definitions utilized in this study.
Richard Paul (1992) explained critical thinking as “the art of thinking about your thinking while you are thinking in order to make your thinking better…” (p. 643) and in a later work (1996) “the intellectually disciplined process of actively and skillfully conceptualizing, applying analyzing, synthesizing, and evaluating information gathered from or generated by observation, experience, reflection, reasoning, or communication, as a guide to belief and action” (p. 95).

Robert H. Ennis (1985), an expert and pioneer in critical thinking measurement, defined critical thinking as “reflective and reasonable thinking that is focused on deciding what to believe or do” (p. 45). The performance of this activity included judging the credibility of sources; identifying conclusions, reasons, and assumptions; judging the underlying reasons, assumptions and evidence of an argument; developing and defending a position on an issue; appropriately probing for clarification of questions; planning and judging experiments; being able to understand definitions within contexts; maintaining an open-mindedness; maintaining a well-informed position; drawing conclusions as needed, always exercising caution (Ennis, 1993).

Watson and Glaser (1980), developers of the Watson-Glaser Critical Thinking Appraisal, described critical thinking as a process, as reflective thinking, and:

as a composite of attitude, knowledge, and skills. This composite includes (1) attitudes of inquiry that involve an ability to recognize the existence of problems and an acceptance of the general need for evidence in support of what is asserted to be true; (2) knowledge of the nature of valid inferences, abstractions, and generalizations in which the weight or accuracy of different kinds of evidence are logically determined; and (3) skills in employing the above attitudes and knowledge. (p. 10)

**Contextualized Definitions Specific to Nursing**

As nursing struggles with the problems of definition and measurement of critical thinking, there is increasing support for the position that critical thinking is a contextual concept and must be defined within the purview of nursing. Two examples of these contextualized definitions are described below.
Kataoka-Yahiro and Saylor (1994) developed a nursing model of critical thinking that defines it as a process that “is reflective and reasonable thinking about nursing problems without a single solution and is focused on deciding what to believe and do” (p. 352). This nursing domain-specific model defines the outcome of critical thinking to be nursing judgment.

A group of nursing experts from nine countries participated in a study to define critical thinking within the context of nursing (Scheffer & Rubenfeld, 2000). Using a Delphi technique, this panel articulated the concept of critical thinking in nursing to be:

… an essential component of professional accountability and quality nursing care. Critical thinkers in nursing exhibit these habits of the mind: confidence, contextual perspective, creativity, flexibility, inquisitiveness, intellectual integrity, intuition, open-mindedness, perseverance, and reflection. Critical thinkers in nursing practice the cognitive skills of analyzing, applying standards, discriminating, information seeking, logical reasoning, predicting and transforming knowledge. (p. 357)

*The American Philosophical Association’s Delphi Report*

Clearly numerous definitions of critical thinking have been espoused. While there is no universal agreement and understanding as to the definition of critical thinking, much progress was made toward a consensus definition with the Delphi Study. In the Delphi Study (Facione, 1990), a panel of 46 people, primarily from the disciplines of education, social or physical sciences, renowned for their experience and expertise in critical thinking instruction, assessment, or theory committed to participate in the Delphi Project, established in part to develop a consensual definition of critical thinking. From this group, critical thinking was defined as “purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual consideration upon which that judgment is based” (p. 2).

This Delphi Study went on to define the attributes of an ideal critical thinker. These attributes are:
...habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and circumstances of inquiry permit. (p. 2)

The definition that emerged from the Delphi Study contributed significantly to the definition of critical thinking adopted by the nursing department in this study, to the development of the instrument utilized in this study, and the skills it enumerates closely match skills needed by nurses in nursing practice. This panel articulated that critical thinking includes the skills of interpretation, analysis, evaluation, inference, explanation, and self-regulation. Each of these skills has specified subskills (see Appendix B for definition of subskills). A brief explanation of these skills is found below.

Interpretation is the ability to understand and articulate the meaning or significance of a variety of experiences, situations, information, beliefs, regulations or criteria. The skill of interpretation includes the subskills of categorization, decoding significance, and clarifying meaning (Facione, 1990).

Analysis is identifying the relationships between various forms of communication that have been intended to express beliefs, judgments, or opinions. The skill of analysis includes the subskills of examining ideas, detecting arguments, and analyzing arguments (Facione, 1990).

Evaluation is the ability to determine the credibility of another’s perception, belief, or opinion as expressed in a verbal or other form of communication. Evaluation includes the subskills of assessing claims and arguments (Facione, 1990).

Inference includes the ability to identify information and data necessary to draw reasonable conclusions and to form conjectures and hypotheses from that information and data.
It also includes the subskills of querying evidence, conjecturing alternatives, and drawing conclusions (Facione, 1990).

Explanation includes the ability to articulate one’s position and arguments and analysis used to determine that position. It includes the subskills of stating results, justifying procedures, and presenting arguments (Facione, 1990).

Self-regulation is to intentionally attend to one’s own cognitive activities and to analyze and evaluate one’s own inferential judgments. It includes the subskills of self-examination and self-correction (Facione, 1990).

Assessment Technologies Institute

The developers of the instrument utilized in this study define critical thinking as a “dynamic, purposeful, analytic process that results in reasoned decision and judgments” (Assessment Technologies Institute [ATI], 2001, p. 1). Just as the definition of critical thinking which emerged from the Delphi Report, ATI defined critical thinking to include the same competencies of interpretation, analysis, evaluation, inference, explanation, and self-regulation.

Critical Thinking Instruments

Just as there are numerous definitions of critical thinking, there are also a number of commercial standardized instruments available for assessing critical thinking skills and/or dispositions. A brief description of the most widely used instruments as well as the instrument used in this study follows.

Watson-Glaser Critical Thinking Appraisal

The Watson-Glaser Critical Thinking Appraisal (WGCTA) was developed in the 1930s and is considered the pioneer critical thinking measurement (Saucier, 1995). The WGCTA is an 80-item multiple-choice test and is the most widely used instrument used to measure the critical
thinking skills of nursing students (Staib, 2003). It provides an overall or raw score and scores on the subsets of inference, recognition of assumptions, deduction, interpretation, and evaluation of arguments. It is discipline-neutral and has a target audience of ninth grade and above (Adams, Whitlow, Stover, & Johnson, 1996).

**California Critical Thinking Skills Test**

The California Critical Thinking Skills Test (CCTST) is available in two forms, Form A and Form B, and is currently one of the more frequently used tools to measure the critical thinking skills of nursing students (Staib, 2003). Form A was developed in 1990, Form B in 1992. Developed by Facione and Facione, it is based on the definition of critical thinking that emerged from the 1990 American Philosophical Association Delphi Report. It is a 34-item multiple-choice instrument measuring and providing scores as a composite and five subscales: analysis, evaluation, inference, deductive reasoning, and inductive reasoning. It is discipline-neutral and has a target audience of college-aged individuals (Adams, Whitlow, Stover, & Johnson, 1996).

**California Critical Thinking Disposition Inventory**

The California Critical Thinking Disposition Inventory (CCTDI) is a companion to the CCTST. It is a 75-item Likert scale which measures the critical thinking dispositions of truth-seeking, open-mindedness, analyticity, systematicity, critical thinking confidence, inquisitiveness, and maturity. Responses are based on levels of agreement, ranging on a 6-point scale; from strongly disagree to strongly agree. It is discipline-neutral and appropriate for college-aged individuals (Staib, 2003).
Ennis-Weir Critical Thinking Essay Test

The Ennis-Weir Critical Thinking Essay Test (EWCTET) is an essay-format test developed to measure critical thinking skills. It tests the critical thinking skills of getting the point, seeing the reasons and assumptions, stating one’s point, offering good reasons, seeing other possibilities, and responding appropriately. It is a discipline-neutral test and has a target audience of high school and college-aged individuals (Staib, 2003; Adams, Whitlow, Stover, & Johnson, 1996).

Cornell Critical Thinking Tests

Cornell Critical Thinking Tests are available in two forms, X and Z, (CCTT-X, CCTT-Z). CCTT-X is a 71-item and CCTT-Z is a 52-item multiple choice instrument designed to test the critical thinking skills of induction, deduction, value judgment, observation, credibility, assumptions, and meaning. It is a discipline-neutral test. CCTT-X has a target audience of 4th grade to 2nd year college-aged individuals; CCTT-Z has a target audience of gifted high school and college-aged adults (Adams, Whitlow, Stover, & Johnson, 1996).

Assessment Technologies Institute – Critical Thinking Assessment

The Critical Thinking Assessment published by Assessment Technologies Institute is a 40-item multiple-choice examination which measures the six cognitive skills of analysis, evaluation, explanation, inference, interpretation, and self-regulation. It provides an overall or composite score and a score on each of the six cognitive skills listed above. This test was designed by “experts in the field of critical thinking in nursing” to specifically test the critical thinking skills of nursing students (ATI, 2001, p. 2).

National League for Nursing Critical Thinking in Clinical Nursing Practice
In response to growing demands for a domain-specific tool to measure critical thinking in nursing students, the National League for Nursing has developed a standardized examination. It was administered experimentally to a group of 1,161 RN students in the spring of 2001, and has not yet been used in nursing research (Staib, 2003).

Other Critical Thinking Measurement Instruments

Other standardized commercial instruments are available for use in measuring critical thinking; however, they have not been used in nursing research. This includes the Collegiate Assessment of Academic Proficiency, the Minnesota Test of Critical Thinking, and the College Outcome Measures Program (Staib, 2003).

Research Studies of Critical Thinking in Nursing

Many studies have sought to determine the impact of a nursing curriculum on the development of critical thinking in nursing students. A review of this research reveals a body of evidence that is inconclusive.

Studies Demonstrating an Increase in Critical Thinking

Frederickson (1979) conducted one of the earliest studies that examined the impact of a nursing curriculum on critical thinking skills. This study involved 14 generic baccalaureate students. These students were administered a critical thinking assessment pretest at time of entry into the nursing program and a critical thinking assessment posttest upon program completion. A significant difference between entry and program completion critical thinking scores at a .01 level was discovered. Examining the relationships between critical thinking total scores and nursing course grade point averages (GPA), the relationship between the pretest scores and GPAs of nursing courses was not statistically significant; however, a significant relationship (p < .05) did exist between the posttest scores and the GPAs of nursing coursework.
Berger (1984) evaluated the impact of nursing education on a group of 137 generic baccalaureate nursing students using the WGCTA. Students were administered the pretest critical thinking assessment during their sophomore year of the nursing program and the posttest critical thinking assessment during the senior year. Findings revealed that a statistically significant improvement occurred in critical thinking skills in this program. Berger also examined the relationship between critical thinking scores and GPAs in nursing and science courses. WGCTA scores were not statistically significant with either.

Gross, Takazawa, and Rose (1987) examined the impact of nursing education on the critical thinking skills of 108 associate (ASN) and baccalaureate (BSN) nursing students and assessed whether there was a correlation between critical thinking skills and academic success of students. Students were given the WGCTA at time of entry into the nursing program and then again upon completion of the program of study. The pretest was administered initially during the first course in the nursing major; ASN students were given the critical thinking assessment upon admission; BSN students were given the examination during their junior year. Both groups were given the posttest upon completion of their respective nursing programs. Attrition during the study resulted in only 37 associate degree students and 34 baccalaureate degree students being administered the exit examination. Findings revealed a significant improvement ($p < .01$) in mean scores for both associate and baccalaureate degree students in critical thinking skills. Gross, et al. (1987) also compared critical thinking scores with a number of variables related to academic success. They compared the entry mean critical thinking scores between those students who completed the program and those who did not; findings revealed no significant difference in these groups. These researchers found the cumulative grade point average to be statistically significant with both pretest and posttest critical thinking scores for baccalaureate
students only. They also found, for the baccalaureate group only, that there was a significant correlation between WGCTA exit scores and National Council Licensure Examination (NCLEX) score.

Thompson and Rebeschi (1999) evaluated critical thinking scores in 38 baccalaureate nursing students who entered the nursing major in the fall of 1995 and graduated in the spring of 1997. Students were administered the CCTST and CCTDI at the end of their first semester in the nursing program. The posttest CCTST and CCTDI were administered two weeks prior to completing the nursing program. The total score of the CCTST increased significantly ($p < .01$) during the study time. While all five subscales of the CCTST increased, none of the increases were statistically significant; however, the increase in the subscale for inductive reasoning approached significance ($p = .05$). Thompson and Rebeschi also looked at the correlation between critical thinking skills and the variables of age and GPA. No correlation was found to exist in these variables.

Miller (1992) evaluated the impact of nursing education on a group of 137 students enrolled in a baccalaureate registered nurse program (BRNP). Students were already registered nurses, graduates from either a diploma or associate degree program. All students entering their BRNP program from autumn semester of 1980 through spring semester of 1983 and who had completed the program by May of 1987 were given a pretest and a posttest using the WGCTA. The pretest was administered during the first course in the nursing major and the posttest was administered during the last course of the nursing major. A statistically significant positive increase was found in the total scores at the .05 level. Interestingly, graduates of the associate degree program actually experienced a slight regression of scores (pretest mean, 71.72; posttest mean 71.60) with diploma program graduates experiencing a substantial increase (pretest mean
All subsets showed growth during the time period but only recognition of assumptions and deductions showed significant increases. Miller also explored the relationship between the posttest total score on the WGCTA and the GPA of nursing courses and the GPA of all other courses. A significant $r$ (.05 level) with the nursing GPA was discovered which accounted for a 4% variance attributable to the BRNP. No significant correlation between WGCTA total score and the GPA of all other courses was found.

To evaluate the success of curricular changes which emphasized the development of critical thinking in nursing students, Spelic et al. (2001) examined the critical thinking skills at program entry and exit of 136 baccalaureate nursing students. Nursing students from three different tracks of a baccalaureate nursing program were enrolled in the study: (1) a traditional track for students entering the nursing program at the sophomore level ($n = 51$); (2) an accelerated nursing track for those students entering the nursing program with a prior baccalaureate or higher degree with prerequisite courses ($n = 68$); (3) registered nurses completing nursing courses for the baccalaureate degree in nursing within one calendar year ($n = 17$). These researchers utilized the CCTST to measure critical thinking skills. Changes in critical thinking skills from entry to exit were statistically significant ($p \leq .01$) for all three tracks in overall and subscale scores with the exception of the Analysis subscale for the RN to BSN students. This subscale was higher upon exit than entry and approached significance ($p = .06$) but did not reach it.

*Studies not Demonstrating an Increase in Critical Thinking*

Sullivan (1987) assessed critical thinking skills, creative thinking ability, academic achievement, and clinical performances in 51 students enrolled in a baccalaureate completion program. RNs having completed either a diploma-level or associate degree program in nursing,
licensed to practice nursing in the state, enrolled in their program between the fall of 1981 and the fall of 1983, and who graduated between May of 1983 and May of 1985 were included in her study. Participants were administered the WGCTA during the first four weeks of the first semester of the baccalaureate program and then again in the last four weeks of their final semester of the program. Only 46 students completed both the pretest and the posttest critical thinking assessment. Sullivan found no significant difference between entry and exit critical thinking total scores. She did find a significant positive correlation between entry and exit critical thinking scores and students’ entry and exit grade point averages. Grade point averages, upon entry, did not include nursing coursework; upon exit, it included the nursing coursework contained in the BSN/RN program.

Bauwens and Gerhard (1987) looked at critical thinking skills in baccalaureate nursing students in order to determine whether they might be early predictors of success in nursing education. The study included administering the WGCTA to 53 baccalaureate nursing students as a pretest during the first week as upper-division nursing students and as a posttest in the final month of the nursing program immediately prior to graduation. This study found no significant difference in entry and exit critical thinking scores. The researchers did find a significant correlation \( p < .01 \) between entry critical thinking scores and NCLEX scores and concluded that the WGCTA could be useful as a pre-admission screening tool for baccalaureate program applicants.

Kintgen-Andrews (1988) administered the WGCTA to a total of 177 students: 55 practical nursing students, 38 pre-health science freshmen, 55 associate degree nursing students, and 29 baccalaureate sophomore nursing students. It was administered as a pretest in the fall at the beginning of the 1985-86 academic year and again as a posttest in the spring, at the end of the
academic year. No significant gains were experienced by any of the groups in the composite or any of the subset scores. The researcher also analyzed the nursing students’ data to determine if a relationship existed between critical thinking scores and nursing course GPAs or NCLEX scores. She found significant correlations between the WGCTA total scores and nursing course GPAs for the practical nursing students on both pretest and posttest ($r = .52, p < .01; r = .65, p < .01$); for the associate degree students on both pretest and posttest ($r = .30, p = .01; r = .47, p < .01$); and, for the sophomore students for the posttest ($r = .41, p = .02$). She also found significant correlations between the WGCTA total scores and the NCLEX scores for the practical nursing students, both pretest and posttest ($r = .55, p < .01; r = .56, p = .01$); and for the associate degree students ($r = .52, p = .01; r = .51, p < .01$).

Maynard (1996) conducted a cross-sectional study looking at the relationship between critical thinking ability and nursing competence. As part of this study, she conducted a longitudinal study including two cohorts (n = 30) of baccalaureate nursing program students to examine the impact of the educational experience on the critical thinking scores of these students. The WGCTA was administered as a pretest prior to admittance into nursing program during the sophomore year; it was administered as a posttest upon completion of all coursework, prior to graduation of their senior year. A total of 24 students completed both the pretest and the posttest. No significant difference occurred in the critical thinking scores of these students.

Vaughan-Wrobel, O’Sullivan, and Smith (1997) evaluated the critical thinking skills of 391 baccalaureate nursing students. Three successive cohorts of nursing students, the classes of 1993, 1994, and 1995, were administered the WGCTA at three points during the nursing program. Students entering this program had completed two years of prerequisite requirements and were beginning the two and one-half years of nursing coursework to complete the Bachelor
of Science in nursing degree. The pretest or initial administration occurred upon entry into the nursing component at the beginning of the summer semester prior to any nursing coursework. The second administration occurred at the end of their junior year. The final administration occurred at the end of the senior year. Their study found no significant differences in critical thinking skills from entry to the end of the junior and senior years for any of the three cohorts after adjusting for age, previous degree, and nursing experience. They did find a small significant correlation between age and the entry WGCTA total score ($p < .01$).

Frye, Alfred, and Campbell (1999) conducted a cross-sectional and longitudinal analysis of critical thinking abilities of freshmen and seniors in a baccalaureate nursing program. Freshmen students were administered the WGCTA during the first month of their first semester in the nursing program. Senior students were administered the WGCTA during their last month of the last semester in the nursing program. For the cross-sectional analysis, 132 freshmen and 77 senior students were administered the WGCTA and scores were evaluated for differences. A significant difference in the critical thinking abilities in the freshman and senior groups was found. For the longitudinal analysis, 27 students tested as freshmen were tested again as seniors and data was collected for changes over time. Longitudinal data revealed no statistically significant change in critical thinking abilities from freshmen to seniors. No significant change in either the composite score or any of the subtest scores was discovered.

Adams, Stover, and Whitlow (1999) conducted a longitudinal study of critical thinking abilities in 203 baccalaureate nursing students. Data collection began in the spring of 1988 and continued through the spring of 1996. Upon admission to the first clinical nursing course during the second semester of their sophomore year, each nursing student was administered the WGTC as a pretest. These same students were then administered the posttest upon completion
of their preceptorship experience during the last semester of their senior year. No significant
difference was found in either the raw critical thinking score or any of the subsets of critical
thinking. These researchers also examined the relationship of critical thinking to variables of
ACT composite scores, GPA, and age. Correlation analysis revealed no significant relationship
with age and WGCTA raw scores. A positive correlation of grade point average (r = .27) with
sophomore WGCTA raw scores and a low positive correlation (r = .15) with senior-level
WGCTA scores was found. A moderate positive correlation between sophomore WGCTA raw
scores and ACT composite scores (r = .53) was found; a lower positive correlation was found
with senior level WGCTA raw scores (r = .26). Significance level or achievement information
was not provided.

Daly (2001) examined critical thinking abilities in 43 nursing students enrolled in the
study institution. He used both quantitative measures, the WGCTA, and qualitative measures to
determine change over time. The WGCTA was administered as a pretest during the first month
in the nursing program and then again during the students’ eighteenth month in the program.
Qualitative measures, which included a videotaped client simulation using a think aloud
technique, were employed during months nine and seventeen of the program. Mean scores were
compared on the pretest and posttest WGCTA and comparisons did not result in statistical
significance. No significant difference was found in any of the sub-test scores.

L’Eplattenier (2001) conducted a repeated measures study examining changes in critical
thinking at four junctures in a baccalaureate nursing program: at program entry prior to taking
nursing courses, at the beginning of the second semester of the second year in the nursing
program (mid-junior year), at the beginning of the first semester of the third year in the nursing
program (beginning of the senior year), and lastly upon completion of the nursing program. A
total of 83 baccalaureate nursing students participated. The researcher used the WGCTA to measure critical thinking skills. Her findings were that scores did not, on average, show improvement through the nursing curriculum. Although some students did demonstrate an improvement after the first year, these students were likely to have had lower pretest scores and their scores did not continue to improve during the study.

Chau et al. (2001) analyzed critical thinking skills to determine the effectiveness of videotaped vignettes in developing critical thinking skills. Using a pretest/posttest design, 83 students enrolled in a baccalaureate nursing program were administered the CCTST prior to viewing any of four videotaped vignettes. After viewing all four of the vignettes, they were administered the posttest. No significant change in critical thinking occurred during the educational experience. Further, they found no statistically significant correlations between total CCTST score and age.

Studies with Mixed Results

Saucier (1995) reports mixed results in her study of six cohorts of baccalaureate degree nursing. The purpose of her study was to discover whether students would score higher on a critical thinking examination upon completion of a baccalaureate program of nursing than they did upon entry. Included in her study were three groups of BSN students (n’s = 16, 32, and 49) and three groups of BSN/RN (n’s = 15, 7, and 9) students, graduating classes of 1990, 1991, and 1992. Each group was administered the WGCTA during the first month of their nursing program. Students were then administered the posttest one month prior to graduation. No significant differences were discovered in any of the three groups of BSN/RN graduates, classes graduating in 1990, 1991, and 1992. Similarly, there were no significant differences discovered
in two of the BSN groups, the 1990 or 1992 BSN graduates. However, a significant difference was found in the 1991 BSN graduates.

In their study to evaluate the impact of an accelerated nursing curriculum on students’ critical thinking abilities, Pepa, Brown, and Alverson (1997) also examined changes in critical thinking upon entry and exit of two groups enrolled in a baccalaureate nursing program. One group of accelerated BSN students (n = 43) and another group of traditional baccalaureate nursing students (n = 45) completed the WGCTA at the beginning of nursing coursework and again upon completion of nursing coursework. Findings revealed a statistically significant difference ($p < .01$) in pretest and posttest critical thinking overall scores with the traditional BSN students. Although the accelerated students did show an increase in critical thinking abilities from the beginning to the end of the program, statistical significance was not achieved.

Leppa (1997) administered the CCTST to 70 students enrolled in an RN baccalaureate program. These students had completed either an associate degree or diploma program in nursing and were licensed to practice nursing in their state. These students were administered the pretest on the first day of the nursing program; the posttest was administered during their last quarter in the nursing program. No statistically significant changes in either the total score or in four of the five subscales was found. The only significant change found was for the Inference subscale and it actually showed a statistically significant ($p < .01$) decrease.

**Meta-Analyses of Nursing Research on Critical Thinking**

Facione (1997) analyzed an aggregate data set that included 7,926 nursing students from 50 programs of nursing throughout the United States. The sample included undergraduate sophomore, junior, and senior nursing students. The CCTST was used to measure critical thinking abilities and data was collected from 1992-1997 from on-site investigators. The
longitudinal data, obtained from a sub-sample of 625 students from 8 different nursing programs, used a pretest and posttest format to analyze changes in critical thinking skills. This study found a statistically significant gain in total scores ($t = 4.56$, $df = 624$, $p < .01$). The scores for all subscales increased from entry to exit, but statistical significance was not achieved. In analyzing the relationship of critical thinking skills to other predictor or academic variables, Facione found a significant correlation between CCTST overall scores, both pretest and posttest, and the ACT, SAT verbal, SAT math, and GRE scores. A statistically significant relationship was also found in overall CCTST scores, both pretest and posttest, and the college admission GPA, the nursing admission GPA, and the final GPA. No significant relationship was found between age and critical thinking abilities.

An integrative review conducted by Adams (1999) summarized the findings of 20 research studies conducted between 1977 and 1995, some of which are detailed above. The purpose of the integrative review was to answer the question, “Does nursing education affect the critical thinking skills of professional nursing students?” (p. 112). These studies examined changes in the critical thinking abilities of nursing students enrolled in accredited diploma degree, associate degree, or baccalaureate degree program of nursing. Of these 20 studies, 10 studies demonstrated a significant increase in critical thinking skills, 6 found no significant change in critical thinking abilities, and 1 reported mixed results. The WGCTA was used in 18 of the 20 studies, 1 study used the Torrence Test of Critical Thinking and 1 used both the Torrence Test and the WGCTA. The conclusion reached by the author was that “there is no consistent evidence that nursing education contributes to increasing the critical thinking abilities of nursing students” (p. 115).
Relationship of Critical Thinking to Achievement in Nursing Education

Many of the studies listed above, in addition to investigating the impact of nursing curricula on critical thinking skills, also examined the impact of critical thinking skills on academic achievement in nursing education. In these studies, the researchers used a variety of variables as indicators of academic achievement, including nursing course GPA, comprehensive GPA, GPA at entry of program, and NCLEX scores.

Several of these studies found a positive influence of critical thinking on achievement. Frederickson (1979) found a positive correlation between total critical thinking scores and grade point average. Research conducted by Bauwens and Gerhard (1987) found a statistically significant correlation between entry WGCTA and NCLEX scores. Kintgen-Andrews (1988) found a significant correlation between WGCTA raw scores and nursing course GPA and also between WGCTA raw scores and NCLEX scores for the three groups of nursing students in their study: practical nursing students, associate degree nursing students, and sophomore baccalaureate students. Research conducted by Sullivan (1987) found a significant positive correlation between entry and exit critical thinking scores and students’ entry and exit grade point averages. Grade point averages upon entry did not include nursing coursework; upon exit, it included the nursing coursework included in the BSN/RN program. Facione (1997) found final GPA to have a statistically significant correlation with CCTST total score.

Other studies found no significant impact of critical thinking on achievement. Research conducted by Berger (1984) found no relationship between WGCTA raw scores and GPAs of either nursing courses or science courses. Thompson and Rebeschi (1999) found no correlation between the CCTST total score and student GPA.
Still other studies discovered a variable impact of critical thinking on achievement. Miller (1992) found a statistically significant correlation between posttest critical thinking score and nursing course GPA; however, this correlation did not exist with GPA from other coursework. Gross, et al. (1987) compared the entry mean critical thinking scores between those students who completed the program and those that did not; findings revealed no significant difference in these groups. Further, these researchers found the cumulative grade point average to be statistically significant with both pretest and posttest critical thinking scores for baccalaureate nursing students only. They also found, for the baccalaureate group only, that there was a significant correlation between WGCTA exit scores and NCLEX score. Frye et al. (1999), in evaluating the correlation between critical thinking scores and NCLEX success, found there to be a positive correlation obtained only on the two subtests of deduction and evaluation of arguments.

Relationship of Critical Thinking to Other Related Variables

Numerous studies also sought to identify predictor variables for critical thinking skills. These predictor variables included SAT verbal scores, SAT math scores, grade point averages, age, total number of credit hours in a variety of subjects, GRE scores, and admission GPA.

Tiessen’s (1987) study sought to determine variables that contributed to students’ ability to think critically. Using the WGCTA, 150 baccalaureate nursing students provided information about the following eight predictor variables: SAT verbal scores, SAT quantitative scores, grade point average, age, total number of undergraduate college credit hours in the natural sciences, total number of undergraduate college credit hours in the behavioral/social sciences, total number of undergraduate college credit hours in the arts and humanities, and total number of undergraduate college credit hours in the professional nursing courses. Low positive correlations
statistically significant at the $p < .01$ level, were found between WGCTA score and the SAT quantitative score (.38), the SAT verbal score (.33), grade point average (.32), and total number of credit hours in the arts and humanities (.30). Age was found to also have a low positive correlation with critical thinking (.16), significant at a $p < .10$ level.

Facione (1997) also found significant correlations between CCTST overall scores and ACT, SAT verbal, SAT math, GRE scores, college admission GPA, and nursing admission GPA. Vaughan-Wrobel, et al. (1997) found entry WGCTA raw scores to be significantly correlated with age. However, many other studies found age not to be significantly correlated with critical thinking scores (Gross et al., 1987; Thompson & Rebeschi, 1997; Adams et al., 1999; Chau et al., 2001).

**Summary**

The review of empirical nursing literature revealed that critical thinking as an educational outcome has been evaluated in a variety of educational environments and populations, using different instruments and processes. The collective outcomes of these studies are inconclusive. Some studies provide support for a positive effect of nursing education on critical thinking skills, others do not, and still others find results to be mixed. Overall, there appears to be no strong support for the impact of nursing education on development of critical thinking skills. Further, there are inconclusive findings with regard to correlations between critical thinking skills and nursing educational achievement. Using a variety of variables as measures of academic success, some studies provide support for this relationship, others do not. The literature about variables predictive of critical thinking skills is inconsistent. The only variable for which there appears to be support is the correlation between SAT scores, both math and verbal, and critical thinking abilities.
CHAPTER 3

METHODOLOGY

The purpose of this study was to examine changes in critical thinking in an associate degree nursing program, to determine if a relationship exists between critical thinking scores and specified measures of academic success, and to determine if a relationship exists between critical thinking scores and student variables of high school GPA, SAT scores, or age.

In this chapter, the research design and dependent and independent variables are discussed and identified. Also in this chapter the setting, research questions, sample description, instrument used, data collection procedure, student consent, definition of terms, and data analyses are described and discussed. Additionally, an overview of the study institution’s current critical thinking strategies and assessments is provided.

Setting

This research was conducted at a small co-educational liberal arts college and university located in the State of Georgia. It is a state-supported unit of the University System of Georgia and operates under the direction of the Georgia State Board of Regents. This institution maintains a commitment to academic excellence and to the provision of a high quality liberal arts education (NGCSU, 2002). The Department of Nursing shares that commitment and enrolls 100-120 students annually in the fall semester into a two-year associate degree program (ASN).
Research Questions

Research questions were:

1. How do students’ scores differ on the composite critical thinking score at entry and at program completion in a selected population of students completing an associate degree nursing program?

2. How do students’ scores differ on the six subsets of analysis, evaluation, explanation, inference, interpretation, and self-regulation at entry and program completion?

3. Is there a difference between entry critical thinking scores for those students who matriculated on a full-time basis in the nursing program and those who did not?

4. What are the observed relationships, if any, between entry critical thinking scores and the GPAs for nursing courses completed?

5. What are the observed relationships, if any, between entry critical thinking scores, program completion critical thinking scores, and end-program grade point averages?

6. Can student background variables of high school GPA, SAT-Math scores, SAT-Verbal scores, or age predict critical thinking scores?

Research Design

This study took place during the fall of 2002 through the spring of 2004. It included students entering the associate degree nursing program in the fall of 2002 and graduating in the spring of 2004. The critical thinking instrument administered to students was part of the ongoing assessment and evaluation process of the Department of Nursing at this institution. This was the first class that was administered the instrument utilized in this study.
Description of the Sample

The participants in this study were a convenience sample of the associate degree nursing students at the study institution. This school offers its associate degree nursing program at four sites: the main campus in Dahlonega, GA and three satellite campuses, two located in Marietta, GA and one located in Gainesville, GA. The main campus is primarily a residential university and has a traditional-aged, white student population. The satellite campuses are commuter in nature and tend to reflect a more non-traditional population, with a greater number of older and ethnically and racially diverse students. Students are admitted into the program once a year in the fall and they are fundamentally a cohort. All students entering the associate degree nursing program during the fall of 2002 were requested to participate in the study.

The entering class of 2002 was composed of 112 students distributed between the main campus and three satellite campuses. All 112 students were asked to participate in this study. Participation was voluntary and of the 112 students, 8 elected not to participate. Data on these students were not collected. Demographics of the 104 participants are listed in Table 1.

Instrumentation

Instrument

The instrument utilized in this study was the Critical Thinking Assessment (CTA) published by Assessment Technologies Institute, LLC (see Appendix C). This company specializes in testing nursing students and its products are used nationally on over 1000 campuses across the country.

The CTA was designed and developed by a group of “experts in the field of critical thinking in nursing” (ATI, 2001, p. 2) and is described as follows:

The objective of the instrument is to determine the student’s overall performance on specified critical thinking skills determined as necessary for success in an academic
program for nursing study. The CTA was developed in compliance with credentialing bodies’ educational outcomes criteria to identify characteristics and skills that demonstrate critical thinking in students. The goal for faculty is to use this diagnostic information and accompanying educational materials for the development or modification of instructional strategies to facilitate higher order thinking skills in their students. The Critical Thinking Assessment is designed to comply with accreditation committee guidelines for documentation of outcome criteria upon entry and exit from the nursing program. (p. 1)

Table 1

Demographics of Study Participants

<table>
<thead>
<tr>
<th>Demographic Variable</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=104</td>
</tr>
<tr>
<td>Age:</td>
<td></td>
</tr>
<tr>
<td>25 and under</td>
<td>58</td>
</tr>
<tr>
<td>26-30</td>
<td>14</td>
</tr>
<tr>
<td>31-40</td>
<td>23</td>
</tr>
<tr>
<td>41-50</td>
<td>9</td>
</tr>
<tr>
<td>Race:</td>
<td></td>
</tr>
<tr>
<td>Caucasian/European American</td>
<td>91</td>
</tr>
<tr>
<td>African American/African Origin</td>
<td>12</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1</td>
</tr>
<tr>
<td>Native American Indian</td>
<td>0</td>
</tr>
<tr>
<td>Asian</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
</tr>
<tr>
<td>Gender:</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>99</td>
</tr>
<tr>
<td>Male</td>
<td>5</td>
</tr>
</tbody>
</table>

The CTA is a multiple choice examination which measures the six cognitive skills of analysis, evaluation, explanation, inference, interpretation, and self-regulation. It provides seven
sets of scores, one for each of the six cognitive skills, or subsets of critical thinking, and a
composite score for global critical thinking. This composite score represents a combination of
all the attributes of critical thinking. The test has 40 questions with each subset having 6 to 8
questions. Each question has a value of one point (ATI, 2001).

The results of the CTA individual performance profile provide the student with the
following information:

Individual percentage score: The number of questions answered correctly divided by the
total number of questions on the assessment (ATI, 2001).

Individual percentage national mean: the average score of all examinees in the ATI data
pool who have previously taken the exam (ATI, 2001).

Individual program mean: the average score of all examinees of the same program type
in the ATI data pool that have previously taken the exam (ATI, 2001).

Individual national percentile rank: the examinee’s rank on a scale of 1-99 among all
other examinees in the ATI data pool who have previously taken the examination (ATI, 2001).

Individual program percentile rank: the examinee’s rank on a scale of 1-99 among all
other examinees of the same program type in the ATI data pool that have previously taken the
examination (ATI, 2001).

Additionally, a group performance profile is available to faculty which reports group
information for both program type and national data.

Validity and Reliability of Instrument.

Reliability refers to the accuracy of a test score and the extent to which the instrument
replicates findings. It includes stability, equivalence, and internal consistency. The reliability of
the CTA was verified with the internal consistency coefficient of Cronbach alpha and a Guttman
split-half coefficient was run for comparative purposes. CTA has a global alpha of .69 and a standardized item alpha of .70 for all 40 items in first-time examinees (ATI, 2001).

Validity refers to the extent the instrument measures what it purports to measure. Construct and content validity is addressed through extensive literature searches, expert analysis of each test item, and a rigorous development process (ATI, 2001).

Overview of Critical Thinking Strategies and Assessment

This institution has a strong commitment to both teaching and assessing critical thinking. Critical thinking is woven throughout the curriculum in the associate degree program in this study and it is regarded as a central theme of the curriculum. Critical thinking is embedded in the philosophy of both the University and the Department of Nursing and is included in the conceptual framework, program and course objectives.

From the recent 2003 Self-Study Report, the ASN Program, Department of Nursing (NGCSU, 2003a) describes its commitment to and inclusion of critical thinking as follows:

- The University Mission Statement & Goals include developing critical and analytical thinking skills.
- The Department of Nursing philosophy states that critical thinking is at the core of the science of nursing and that part of its mission is to promote the development of critical thinking.
- As part of the Department of Nursing conceptual framework/associate degree program, one objective is to recognize that critical thinking is essential to being a provider of care and that the manager of care must be able to critically evaluate the outcomes of care provided.
A core performance standard for admission and progression requires “critical thinking ability sufficient for clinical judgment” (p. 12).

Level objectives, which include objectives established for the first and second year of the associate degree program, include using critical thinking to provide nursing care to patients and their families.

Individual course objectives also include critical thinking as an integral part of successful completion.

Due to its prominence, multiple strategies are employed to foster the development and growth of critical thinking. These strategies are diverse and woven throughout the curriculum. They include various assignments and projects including nursing care plans, case studies, role playing, application- and analysis-style test questions, problem-solving activities, clinical experiences with post-conference discussions, and reflection journals.

Not only is the necessity of teaching critical thinking skills clearly recognized and articulated, but the responsibility to evaluate the effectiveness is also embedded in the University’s Mission Statement and Goals. The University is committed to continually assess and improve the process of institutional effectiveness.

The Department of Nursing, also committed to the process of assessment, employs a variety of measures to assess the effectiveness of critical thinking instructional strategies including (NGCSU, 2003a):

- Exit surveys: Students complete these in their last semester prior to graduating. These surveys ask the students to evaluate how the nursing program utilized, taught, and required critical thinking for completion.
- Graduate surveys: Students are surveyed one year post-program completion. This survey seeks student perception as to their abilities to utilize critical thinking on the job.

- Employer surveys: Employers of ASN graduates are asked to comment on the critical thinking skills of graduates.

- ATI’s Critical Thinking Assessment: Pretests and posttests are administered to measure critical thinking. This is the instrument used in this study.

- Portfolios: Portfolios are maintained on each student as they progress through the ASN program. Specified assignments are evaluated for critical thinking skills and the students’ performance as they progress throughout the program is evaluated upon graduation.

Student Consent

All students admitted to the ASN nursing class in the fall of 2002 were provided an information sheet explaining the study. Attached to the information sheet were two copies of a consent form (see Appendix D). The consent form included the study title, the name of the researcher and researcher contact information. It also included the fact that participation is voluntary and either choosing not to participate or agreeing to participate and subsequently withdrawing consent would have no negative consequence to the student, and that participation would have no impact on grades or other evaluations. Further, the consent form explained to students the data that would be utilized in the study. Students were informed that the information to be gathered included pretest and posttest CTA scores, grade point averages, high school grade point average, SAT score, age, race, and gender. Anonymity was assured. To further maintain confidentiality, students were assigned a code number and only the primary researcher had access to the codes.
The researcher is an Assistant Professor of Nursing at the study institution and teaches in the first year curriculum at one of the satellite campuses. Classroom instruction takes place via the videoconferencing network, Georgia Statewide Academic and Medical System (GSAMS). A nursing faculty member is located at the main campus and the three satellite sites and this interactive video system allows the faculty member to teach at one site and be broadcast simultaneously to the other three sites. All students receive the same lecture at the same time. Teaching is rotated between the four sites with expertise of the faculty member being a critical determinant in scheduling the instructor for the day. Teaching via interactive television minimizes direct contact with students on other campuses, although some contact with all students is possible.

Data collected for this research involved the use of educational tests administered to participants as part of the normal assessment and evaluation of the associate degree nursing program. All reports generated from this study are reported in group form and individual names are not used in any report. Only the principal researcher has access to identifiable and confidential data.

Data Collection Procedure

Institutional Review Board approvals were obtained from the University of Georgia and from the institution in this study (see Appendixes E and F). Principles of informed consent and protection of human subjects were maintained throughout the study.

Data collection occurred in two time frames. As part of the Nursing Department’s assessment and evaluation process, subjects in this study received a pretest critical thinking assessment in December of 2002 during their first semester in the associate degree nursing program. As a continuing part of the Nursing Department’s assessment and evaluation process,
subjects were administered a posttest critical thinking assessment in April of 2004 during their last semester in the associate degree nursing program. All assessments were computerized.

This study focused on the following variables: entry, or pretest, critical thinking examination (CTA1); program completion, or posttest, critical thinking examination (CTA2); age; scholastic aptitude test-verbal (SAT-V); scholastic aptitude test-math (SAT-M); high school grade point average (GPA); GPA from all nursing courses completed; end-program GPA; and matriculation time.

Data Analysis

Descriptive and inferential statistics were used in this study. Data were analyzed using the JMP statistical software package, Version 5.1, from SAS Institute, SAS Campus Drive, Cary, NC. The data were analyzed for normality. The sample size is large and the statistical tests involved are robust to the normality requirement when large sample sizes are involved.

Matched pair t-tests were used to determine if a difference existed between composite critical thinking scores on CTA1 and CTA2. Six matched pair t-tests were used to determine if differences existed on the six subsets of critical thinking on CTA1 and CTA2. A Bonferroni t method was used and the alpha level for each test was lowered to .01 in order to reduce the likelihood of a Type I error overall. A two-sample t-test was used to determine if a difference existed between CTA1 composite scores for those students who matriculated on a full-time basis and those who did not. Correlational analysis was performed to examine the relationship between CTA1 scores, nursing GPAs, CTA2 scores, and end-program grade point averages. Several simple regressions were performed to determine whether the predictor variables of high school GPA, SAT-V, SAT-M, or age were related to CTA1 or CTA2 overall scores.
After evaluating the statistics, the decision to accept or reject the null hypothesis was made. If the $p$ value was less than .05, the null was rejected. If the $p$ value was greater than .05, the null was accepted. The significance level was changed to .01 when analyzing each of the scores on the six subsets of CTA1 and CTA2 using a series of paired sample t-tests to reduce the likelihood of a Type I error overall.

Hypotheses:

$H_{01}$: There will be no statistically significant difference between CTA1 and CTA2 composite scores.

$H_{02}$: There will be no statistically significant difference between CTA1 and CTA2 subset scores.

$H_{03}$: There will be no statistically significant difference in the means of CTA1 between those students that matriculated on a full-time basis and those that did not.

$H_{04}$: There will be no statistically significant relationship between CTA1 scores and the GPA of nursing courses completed.

$H_{05}$: There will be no statistically significant relationship between CTA1 scores, CTA2 scores, and end-program grade point averages.

$H_{06}$: There will be no statistically significant relationship between CTA scores and high school GPAs, SAT-Ms, SAT-Vs, or ages.

Definition of Terms

The following terms are important to this study.

*Full-time Matriculation*

Full-time matriculation is the completion of the associate degree nursing program plan of study in four semesters as described in the Program of Study.
NCLEX

The National Council Licensure Examination (NCLEX) is the national licensure examination taken by nursing program graduates and is the culminating experience required in order to function as a registered nurse.

High School Grade Point Average

High school grade point average (GPA) is the student’s GPA upon completion of high school.

End-program Grade Point Average

End-program grade point average (GPA) is the student’s GPA upon completion of the associate degree nursing program. It includes nursing and non-nursing coursework.

Nursing Course Grade Point Average

Nurse course grade point average (GPA) is the student’s GPA for only those nursing courses completed.

SAT-V

SAT-V is the comprehensive Scholastic Aptitude Test-Verbal score recorded at time of admission to the associate degree nursing program.

SAT-M

SAT-M is the comprehensive Scholastic Aptitude Test-Math score recorded at time of admission to the associate degree nursing program.

Summary

This chapter presented the methodology utilized in this study. This was a longitudinal study covering a two year time period. The convenience sample included 104 nursing students entering the associate degree nursing program in the fall of 2002. Students were provided
information about the study and signed consent forms for voluntary participation. The instrument used was the Critical Thinking Assessment published by Assessment Technologies Institute, LLC. Data were collected from student records and from scores obtained from administration of the CTA1 and CTA2. Data was analyzed using SAS software and descriptive and inferential statistics.
CHAPTER 4

RESULTS

This study was conducted to examine changes in critical thinking in an associate degree nursing program, to determine if a relationship exists between critical thinking scores and specified measures of academic success, and to determine if a relationship exists between critical thinking scores and student variables of high school GPA, SAT scores, or age.

Participation in this study was voluntary. Of the 112 entering students, 8 chose not to participate. The total number agreeing to participate was 104. All data was analyzed using statistical software package, JMP, Version 5.1, from SAS Institute, SAS Campus Drive, Cary, NC.

According to Moore (2000), a pretest and posttest on the same subjects calls for matched pairs t procedures and the procedure is quite robust with regard to assumptions of homogeneity of variance when larger samples ($n > 40$) are involved. This is true even when distributions are clearly skewed.

Assumptions:

1. Distribution is approximately normal: As stated the t-test is very robust with large sample sizes. Histograms and scatter plots verified the normality of the distribution.

2. Homogeneity of residuals: Graphs of the residuals versus the predicted values showed that this assumption was met.
Table 2 lists the descriptive statistics for the 104 participants in the study. All 104 students took the pretest, CTA1, at the beginning of the nursing program. However, only 60 completed the nursing program at the anticipated time and therefore only 60 were administered the posttest, CTA2, during the spring of 2004. Pretest data has been separated on the 60 students completing the CTA2 data and is reported below the CTA2 statistics, labeled CTA1-completers.

Analysis of Research Questions

A matched pair t-test was used to determine if a significant difference existed in the critical thinking assessment composite scores upon entry to the nursing program and upon successful completion of the program. Matched pair t-tests are appropriate with before- and after- observations on the same subjects according to Moore (2000) and are considered robust as to the assumptions of homogeneity of variance. This principle of robustness is true even when the distribution is skewed with large samples, \( n \geq 40 \). An alpha level of .05 was used to test for statistical significance.

A series of matched pair t-tests were also used to determine if a significant difference existed in the critical thinking assessment subset scores of analysis, evaluation, explanation, inference, interpretation, and self-regulation upon entry to the nursing program and upon successful completion of the program. To control for the likelihood of an increase in the Type I error rate that would result from doing multiple t-tests, the Bonferroni t method was used and the alpha level for each test was lowered to .01 to test for statistical significance.

A two sample t-test was used for comparisons of entry CTA composite scores between those students who matriculated on a full-time basis and those who did not. Correlation analyses were used to examine the relationships between entry CTA scores, nursing course GPAs, post-program CTA scores, and end-program grade point averages.
Several simple linear regression analyses were used to examine the relationship between the CTA scores, the dependent variables, and the independent variables of high school GPA, SAT-verbal, SAT-math, and age. An alpha level of .05 was used to test for statistical significance.

**Research Question 1**

Research Question 1 asks how do students’ scores differ on the composite critical thinking scores at entry and at program completion in a selected population of students completing an associate degree program.
Although there were 104 students that took the CTA1 examination, only 60 completed the posttest. Therefore, only 60 matched pair samples were obtained from the participants. Findings are displayed in Table 3.

---

Table 3

_Difference in Mean Composite Scores from Entry to Program Completion (n=60)_

<table>
<thead>
<tr>
<th>CTA1</th>
<th>CTA2</th>
<th>SD</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Mean</td>
<td>Completion Mean</td>
<td></td>
<td></td>
</tr>
<tr>
<td>71.63</td>
<td>71</td>
<td>1.41</td>
<td>-0.44</td>
</tr>
</tbody>
</table>

The matched pair t-test analysis revealed no significant difference at the .05 level (p = 0.66) for the CTA composite test scores. Hypothesis 1 stated there is no statistically significant difference between the composite scores of CTA1 and CTA2. No statistically significant differences between CTA1 and CTA2 were found; therefore, the null hypothesis is accepted.

**Research Question 2**

Research Question 2 asks how do students’ scores differ on the six subsets of analysis, evaluation, explanation, inference, interpretation, and self-regulation at entry and program completion.

A series of six matched pair t-tests were used to evaluate the difference in the subsets at entry and program completion. A Bonferroni t method was used and the alpha level was lowered for each test to .01 in order to reduce the likelihood of a Type I error overall. Findings are displayed in Table 4.
**Table 4**

*Difference in Subset Mean Scores from Entry to Program Completion (n=60)*

<table>
<thead>
<tr>
<th>Subset</th>
<th>CTA1 Entry Mean</th>
<th>CTA2 Completion Mean</th>
<th>SD</th>
<th>t-ratio*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analysis</td>
<td>82.22</td>
<td>76.66</td>
<td>2.87</td>
<td>-1.93</td>
</tr>
<tr>
<td>Evaluation</td>
<td>74.58</td>
<td>72.50</td>
<td>2.30</td>
<td>-0.90</td>
</tr>
<tr>
<td>Explanation</td>
<td>75.70</td>
<td>72.84</td>
<td>2.32</td>
<td>-1.23</td>
</tr>
<tr>
<td>Inference</td>
<td>52.97</td>
<td>53.53</td>
<td>2.66</td>
<td>0.21</td>
</tr>
<tr>
<td>Interpretation</td>
<td>68.05</td>
<td>72.22</td>
<td>2.87</td>
<td>1.45</td>
</tr>
<tr>
<td>Self-Regulation</td>
<td>90.00</td>
<td>93.75</td>
<td>2.51</td>
<td>1.49</td>
</tr>
</tbody>
</table>

*Not significant at p = .01 level

The matched pair t-test analyses revealed no significant difference at the .01 level for any of the subset scores.

Hypothesis 2 stated there is no statistically significant difference between any of the six subsets of CTA1 and CTA2. There were 60 matched pairs. No significant difference was noted at the .01 level for any of the six subsets, therefore, the null hypothesis is accepted.

*Research Question 3*

Research Question 3 asks if there is a difference between entry critical thinking composite scores for those students who matriculated on a full-time basis and those who did not.
The 104 students were divided into two groups, those who did matriculate on a full-time basis and within the expected two years (Level 1) and those who did not (Level 2). Those who did not had either dropped out of the nursing program, failed a course and could not proceed with matriculation as originally planned, or made the decision to attend part-time. These two groups represented two completely distinct populations with samples being completely independent from one another. A two-sample t-test was used to answer this research question. The two-sample t-test is very robust even when distributions are not symmetric (Moore, 2000). The Welch’s test which assumes unequal variances was used. Findings are displayed in Table 5.

<table>
<thead>
<tr>
<th></th>
<th>Level 1 (n = 60)</th>
<th>Level 2 (n = 44)</th>
<th>t-ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>71.63</td>
<td>62.05</td>
<td>3.30*</td>
</tr>
<tr>
<td>SD</td>
<td>1.75</td>
<td>2.04</td>
<td></td>
</tr>
</tbody>
</table>

*p < .01

Because there was no specific direction for the CTA impact on matriculation, the two-sided hypothesis was chosen. A mean difference of 9.58 between Level 1 and Level 2 was found which was a statistically significant difference. The mean of the group that matriculated on a full-time basis was statistically significantly higher ($p < .01$).

Hypothesis 3 states that there is no statistically significant difference between the CTA1 scores and full-time matriculation. Differences between the group that matriculated on a full-time basis and the group that did not were significant at the .05 level, therefore the null hypothesis is rejected.
Research Question 4

Research Question 4 asks what, if any, are the observed relationships between entry critical thinking scores and GPAs of nursing courses completed. Of the 104 students that agreed to participate in this study, 16 dropped out prior to completing any of the nursing courses. Therefore, data was available on 88 students and this data was included in this analysis. Correlation analysis was performed to examine the relationships between these variables. Approximately one-fourth, $r^2 = 0.24$ of the variation in nursing course GPA is accounted for by the linear relationship with entry critical thinking scores, which is statistically significant ($p < .01$).

Hypothesis 4 states that there is no statistically significant relationship between CTA1 scores and GPAs of nursing courses completed. Data analysis reveals that there is a statistically significant relationship ($p < .01$) between CTA1 scores and nursing course GPAs. Hypothesis 4 is rejected.

Research Question 5

Research Question 5 asks what, if any, are the observed relationships between CTA1 composite scores, CTA2 composite scores, and end-program grade point averages. Correlational analysis was performed to determine if a relationship existed between these variables. Findings are displayed in Table 6.

Hypothesis 5 states that there will be no statistically significant correlation between CTA1 composite scores, CTA2 composite scores, and end-program GPA. Data analysis reveals that no statistically significant relationship existed between the end-program GPA and CTA1 score or the CTA2 score. The only statistically significant relationship existed
between entry CTA scores (CTA1) and program completion CTA scores (CTA2), $r = 0.36$, $p < .01$. The sample size was large enough to make this significant so this hypothesis is rejected.

**Research Question 6**

Research Question 6 asks can student background variables of high school GPA, SAT-Verbal, SAT-Math, or age predict scores on critical thinking assessments.

Several simple regression analyses were performed to determine how well the measures of high school GPA, SAT-verbal, SAT-math, or age predicted CTA composite scores, either pretest or posttest. Not all data was available for all students. Findings are displayed in Table 7.

Data analyses reveals that SAT-math ($F = 5.96, r^2 = 0.13, p = .02$), and age ($F = 18.21, r^2 = 0.16, p < .01$) are statistically significant predictors of CTA1. SAT-verbal was statistically significant until an extreme outlier, a student having a score of 230, was removed. When this outlier was removed, the relationship was no longer statistically significant, ($F = 2.98, r^2 = 0.07, p = .09$). No significant relationships between CTA2 and these variables was found.
Hypothesis 6 states that the independent variables of high school GPA, SAT-V, SAT-M, or age are not predictive of CTA1 or CTA2. No statistically significant relationships between any of these variables and CTA2 was found. However, results from the regression analysis indicate that SAT-M and age are statistically significant predictors of CTA1 and the null hypothesis is rejected with regard to CTA1.
Summary

In summary, the results from this longitudinal study of associate degree nursing students reveal that there is no statistically significant difference in either the composite or six subset scores of CTA1 and CTA2. The data analyses further reveal that there is a correlation between CTA1 composite scores and matriculation time and GPA of nursing coursework. Neither CTA1 nor CTA2 composite scores correlated with end-program GPA. Regression analysis revealed a positive correlation between CTA1 composite scores and SAT-Math and a negative correlation with age. No correlation between these variables and CTA2 composite scores was found.
CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Overview

The purpose of this study was to examine critical thinking within the context of an associate degree nursing program at a small co-educational liberal arts college and university in the state of Georgia. It examined changes in critical thinking assessment scores from the beginning of the program to the end of the program. In doing so, it sought to determine the impact that the nursing curriculum had on critical thinking over the period of a two year program. It also explored relationships between critical thinking scores and academic success, and between critical thinking and certain predictor variables. This chapter provides a brief overview of the study, including the interpretations of results, implications for nursing education, and the recommendations for further research.

This study was a longitudinal study conducted over a two year period and utilized a pretest/posttest convenience sampling design. The sample was comprised of associate degree students entering a nursing program in the fall of 2002. A total of 112 students entered the nursing program and all were recruited to participate in this study; 8 elected not to participate and data on those students were not collected. All students were administered a pretest critical thinking assessment (CTA1) in the first semester of the nursing program. Data were collected on the 104 students who agreed to participate in the study. During the two years of the associate degree program, 44 students either dropped out of the program or changed to part-time status.
Only 60 of the original 104 were administered the posttest critical thinking assessment (CTA2) during the time period of this study.

Interpretation of Results

Research Questions 1 and 2 examined changes in critical thinking scores from the beginning of the nursing program to the end of the nursing program. Question 1 examined the changes in the composite scores; Question 2 looked at changes in the subsets of critical thinking: analysis, evaluation, explanation, inference, interpretation, and self-regulation. Data analyses found no significant differences between the pretest and posttest composite scores or in any of the subsets. While statistical significance was not achieved, it is worth noting that there were regressions in the composite scores and three of the subsets: analysis, evaluation, and explanation.

In reviewing the empiric research examining the impact of nursing education on critical thinking skills, the inconclusive nature of the evidence is apparent. The findings of this study are consistent with the body of literature revealing an absence of educational impact on critical thinking scores using standardized examinations. Numerous studies show no significant changes over time (Sullivan, 1987; Bauwens & Gerhard, 1987; Kintgen-Andrews, 1988; Maynard, 1996; Vaughn-Wrobel, O’Sullivan, & Smith, 1997; Frye, Alfred, & Campbell, 1999; Adams, Stover, & Whitlow, 1999; Daly, 2001; L’Eplattenier, 2001; Chau et al., 2001).

However, other studies have found a positive impact of education on critical thinking scores using standardized examinations and the findings of this study are inconsistent with those findings. Several studies show increases in critical thinking over time (Frederickson, 1979; Berger, 1984; Gross, Takazawa, & Rose, 1987; Thompson & Rebeschi, 1999; Miller, 1992;
Facione, 1997; Spelic et al., 2001). Still other studies yielded mixed results (Saucier, 1995; Pepa, Brown, & Alverson, 1997; Lepa, 1997).

The conclusion may be reached that there is no strong support for the impact of nursing education on critical thinking skills and the findings of this study contribute to that conclusion. These findings have many implications not only for this program but also for nursing education in general. Teaching critical thinking skills has not only been mandated by the NLN but has also been identified as an essential skill for practitioners of the 21st century. The fact that there were no significant changes in critical thinking scores over time and that there is no strong support in the literature for changes over time, begs the question, why not?

In order to answer this question, this program of nursing should scrutinize several variables related to critical thinking in their curriculum. In order to determine whether teaching critical thinking is being adequately incorporated and taught, an evaluation of the curriculum and teaching strategies designed to teach critical thinking should be conducted. Additional variables that potentially influence these findings include faculty preparedness to teach critical thinking skills, how critical thinking is defined and measured, timing of the posttest and student motivation.

The issue of faculty perception, knowledge, and preparedness to teach critical thinking has implications not only to this institution but to nursing education in general. Jones and Brown (1991) sent out 470 surveys to deans or directors of each identified NLN accredited baccalaureate and higher-degree nursing program in the United States; 225 were returned and usable. The purpose of their survey was to discover how critical thinking is being interpreted and taught in programs of nursing across the country. While an overwhelming majority (97%) indicated that critical thinking was integrated into their programs, results indicated that there is
much disparity and confusion about the interpretation of the concept. It was commonly defined in very narrow and oftentimes contradictory terms. Training of faculty to teach or model critical thinking was also lacking in many cases and there was a general perception that graduate education automatically prepared faculty for this function. It was clear to these researchers that there was a significant lack of clarity and understanding about the mechanisms or operations of critical thinking among nursing educators. Their conclusion could be summarized as follows:

Nurse educators, who are unskilled in their own critical thinking, are unable to share their skills with students. While the education of students is admittedly not a one-item agenda, the issue of critical thinking development is urgent. Critical thinking can give nursing a lifeline into the future development of the discipline. (p. 533)

The findings of Jones and Brown (1991) are supported by Saarmann, Freitas, Rapps, and Riegel (1992) in their cross-sectional study comparing critical thinking abilities and values in associate degree-prepared registered nurses, baccalaureate degree-prepared registered nurses, nursing faculty, and sophomore college students who were beginning a baccalaureate degree program in nursing. Using the Watson Glaser Critical Thinking Assessment, nursing faculty having at least a master’s degree in nursing did score higher than the other groups; however, after controlling for age, the difference was not statistically significant with any of the groups.

This concern for teacher-preparedness extends beyond the field of nursing. Paul, Elder, and Bartell (1995) conducted 140 interviews with faculty members at 38 public universities and 28 private universities in the State of California in order to assess the extent to which teacher education programs prepare their students to teach critical thinking in elementary and secondary schools. Results included the fact that although a majority (89%) believed critical thinking to be a primary objective of their instruction, only a small number (19%) could clearly articulate a definition of critical thinking. Only 8% could differentiate between an assumption and an
inference. Only 8% could describe the critical thinking skills they believed to be important for their students to develop.

Issues of how critical thinking is defined by programs of nursing must also be explored when considering the lack of support for the development of critical thinking skills. In order to discover how baccalaureate schools of nursing were meeting the NLN requirements related to critical thinking, Videbeck (1997) obtained information from 55 NLN-accredited programs from 30 states. She found that 28 of these schools used definitions of critical thinking which originated in the nursing literature; 22 schools used definitions which originated in non-nursing literature. She found that 43 of these schools utilized definitions that had both a cognitive and an affective component; 12 utilized definitions that considered a cognitive component only.

Videbeck discovered a wide variety of processes, methods, and measurements being utilized in complying with NLN standards related to critical thinking. While the NLN requires each program to provide their own definition of critical thinking, it is plausible that the absence of a consensus definition may contribute to the inconsistent results found in the literature.

Another consideration that has broad implications is how critical thinking is measured. A growing number of nurse researchers are recognizing the contextual aspects of critical thinking and that critical thinking in nursing may be very different than critical thinking in other fields. Since critical thinking skills may vary by discipline, a domain-specific instrument may be required.

In addressing this issue and espousing a need for a nursing-specific instrument, Kowalski and Louis (2000) claim that:

Validation requires appropriate instruments. However, instruments commonly used to measure critical thinking, such as The Watson-Glaser Critical Thinking Appraisal, the California Critical Thinking Cognitive Skills Test and the California Critical Thinking Dispositions Inventory are standardized tests developed for the general population.
Because critical thinking in nursing involves decision making and problem solving in clinical situations that are unlike ordinary human experiences, most nursing educators find that these instruments are inadequate to measure critical thinking specific to nursing. (p. 210)

L’Eplattenier (2001) purports that the inconsistent results found in nursing research related to impact of nursing education on critical thinking skills may be “related to the fact that the majority of research relies on WGCTA scores, and the WGCTA may be an inappropriate measure of critical thinking in nursing” (p.30). Adams, Whitlow, and Stover (1999), in finding no changes in critical thinking abilities in baccalaureate nursing students, concluded that, “The results of this study clearly indicate that the WGCTA is not the instrument of choice for a longitudinal measurement of critical thinking abilities of BSN students” (p. 141). These concerns about using a broad, objective test to measure critical thinking in nursing are echoed throughout the nursing research community (Chau et al., 2001; Daly, 2001; Vaughan-Wrobel et al., 1997).

This study used an instrument developed by “experts in the field of critical thinking in nursing” to specifically test the critical thinking skills of nursing students (ATI, 2001, p. 2). Even with this instrument, findings did not reveal an impact of nursing education on critical thinking skills. Timing of the assessments and student motivation must also be examined when considering the findings of this study. The exit critical thinking assessment is administered near the end of the last semester of the nursing program. The multiple stressors that students are experiencing at that time will, in all likelihood, have an impact on the results. Additionally, there is no incentive for students to do well and they oftentimes report not taking the critical thinking assessment seriously; this problem is noted in other studies (May, Edell, Butell, Doughty, & Langford, 1999). Measures to enhance student motivation to do well should be considered. Because critical thinking is an invaluable skill, schools of nursing are required to teach it,
measure it, and revise the curriculum if assessment indicates the need to do so. When students have a lackadaisical approach to performance on the critical thinking assessment, it is impossible to accurately determine whether schools of nursing are meeting this responsibility.

Research Questions 3, 4, and 5 were directed at assessing critical thinking skills and various measures of academic success. Question 3 explored the relationship between critical thinking and persistence, measured by full-time matriculation status. Question 4 examined the relationship between entry critical thinking scores and nursing coursework GPAs. Research Question 5 explored the relationship between entry CTA scores, post-program CTA scores, and cumulative grade point averages.

Data analyses yielded mixed results. On the one hand, the findings suggest that students with higher critical thinking skills and scores will demonstrate greater academic success, as demonstrated by greater persistence and higher nursing course GPAs than those students with lower scores. On the other hand, when looking at the relationship between critical thinking scores and end-program GPAs, students with higher critical thinking scores did not have significantly different end-program GPAs than those students with lower scores. However, this finding could be strongly influenced by having to discard unmatched scores. In order to have an end-program GPA, the student must have completed the program of nursing within the time frame of this study. Of the 104 who began the study, only 60 completed the program during this period; 44 students’ entry CTA scores had to be discarded when looking at the relationship between entry CTA scores and end-program GPA. This finding could be further affected by the fact that GPAs are based on alphabetic course grades which can reflect a broad range of academic achievement. In nursing at the study institution, a range of numeric scores for each grade designation exists: $A = 91 - 100; B = 81 - 90; C = 75 - 80; D = 65 - 74; F = 0 - 64$. This
could decrease the sensitivity of the analysis to determine a correlation between critical thinking scores and end-program GPAs.

As with the impact of nursing education on critical thinking skills, the research on the influence of critical thinking skills on academic success is inconclusive. There is a body of evidence that supports the findings for a positive impact of critical thinking on achievement in nursing education (Frederickson, 1979; Bauwens & Gerhard, 1987; Kintgen-Andrews, 1987; Sullivan, 1987; Facione, 1997; Adams, Stover, & Whitlow, 1999). Additional literature is available which indicates little or no impact of critical thinking skills on achievement in nursing education (Berger, 1984; Thompson & Rebeschi, 1999). The findings of this study are most consistent with those studies which found mixed results of impact of critical thinking skills on achievement in nursing education (Gross, Takazawa, & Rose, 1987; Miller, 1992; Frye, Alfred, & Campbell, 1999).

The issue of whether critical thinking skills influence academic achievement has potentially significant implications to this program and to the profession of nursing. The finding in this study is that critical thinking may be predictive of academic success in nursing education. A significant difference in CTA scores between the students who completed on a full-time basis and those who did not was found. Further, there was also a significant relationship between entry critical thinking scores and nursing course GPAs, with approximately 24% of the variability in nursing course GPA accountable for by the linear relationship with critical thinking score. While generalizability must be done with caution, it does appear that higher scores on CTA1 are to some extent predictive of success in the nursing program. This information has major implications for recruitment and retention of students. CTA scores could be used as either part of the admission process or to recognize the need for remediation and initiation of
appropriate interventions to assist those students with low scores early in the educational experience. Consequences of attrition include a tremendous cost to educational institutions, estimated by Catalano and Eddy (1993) to be between 30 and 72 million dollars annually. An even greater consequence of nursing student attrition is that it results in an insufficient number of nurses to meet the healthcare needs of the citizenry (Wells, 2003).

Research Question 6 sought to determine if a relationship existed between CTA scores and student background predictor variables of high school GPA, SAT-Math, SAT-Verbal, and age. The relationship between CTA1 and SAT-Math was the only one found to have a statistically significant positive correlation. Age was found to have a statistically significant negative relationship with CTA1. No statistically significant relationships were found between CTA2 and any of the predictor variables.

The research examining the impact of these predictor variables on critical thinking scores was limited. While some of the research does seem to support a relationship between other aptitude tests and critical thinking, findings were not consistently in support of these variables. Tiessen (1987) found that of the variables SAT-V, SAT-M, GPA, age, undergraduate credit hours in the behavioral/social sciences, undergraduate credit hours in the arts and humanities, undergraduate hours in the professional nursing courses, and undergraduate hours in natural sciences, those most strongly correlated with critical thinking skills were, in order: SAT-M, total credit hours in arts and humanities, and GPA. Facione (1997) found significant correlations between overall critical thinking scores and ACT scores, SAT-Verbal scores, SAT-Math scores, GRE scores, college admission GPAs, and nursing admission GPAs. Findings revealed mixed results related to the relationship between age and critical thinking, with some studies showing
no correlation (Gross et al., 1987; Adams, et al. 1999) and some studies finding a correlation (Tiessen, 1987; Vaughan-Wrobel et al., 1997).

Limitations of the Study

Limitations of this study include the sample, attrition of the sample population, computerized testing, and student motivation. This was a non-randomized convenience sample, focusing on associate degree nursing students admitted into the nursing program in the fall of 2002 at the study institution. Attrition resulted in 104 students taking the pretest and only 60 being administered the posttest. In some instances, this resulted in the entry scores being excluded, and as some of the research questions focused on results of both the pretest and the posttest, this could potentially affect the results. Both pretests and posttests were administered via computer. Individual student’s computer skills may have had an impact on the scores. The motivation of students to perform on this low-stakes exam may be questioned. The pretest critical thinking assessment is administered during the first semester of the nursing program. While the scores are not tied to grades and there is no reward for doing well, students are new and often eager to do well; the posttest critical thinking assessment is given near the conclusion of the nursing courses and at the end of the course of study. At this time, students are preparing for final examinations, focusing on taking the NCLEX, and experiencing considerable stress. Since the critical thinking scores are unrelated to a course grade, motivation to do well on the assessment may be diminished or completely absent. This is especially true on the exit assessment which could significantly affect measures of growth over time. Due to these limitations, caution should be used in generalizing the results of this study.
Implications for Nursing Education

Issues of student motivation, faculty preparedness to teach critical thinking, definition, measurement, and instrumentation have already been discussed. Another area of concern to this author and one that is worth noting is that the preponderance of research on nursing has been conducted with baccalaureate nursing programs and students. However, the need for critical thinking skills are as relevant for associate degree nurses as they are for baccalaureate prepared nurses. Considering the number of programs at the associate and baccalaureate level, the number of graduates from each, and the current composition of the nursing workforce in the United States, it is clear that research cannot continue to, for the most part, ignore critical thinking skills with associate level programs and students.

Graduates of nursing programs, whether diploma, associate or baccalaureate degree, take the same National Council Licensure Examination, and receive the same nursing licensures from the states in which they take the examination. They are usually hired to do the very same work and perform the same patient-care responsibilities. According to the U. S. Department of Labor (2002), approximately one-half of the nursing programs in the United States are at the associate degree level. In 2004, there were 53,275 graduates from associate degree nursing programs with an 85.3% NCLEX-RN pass rate. Only 30,648 graduated from baccalaureate programs with an 84.8% NCLEX-RN pass rate (National Council of State Boards of Nursing, 2004). An action report by the American Nurses’ Association (1999) reports the educational makeup of the current registered nurse workforce to be: 27% diploma; 32% associate degree; 31% baccalaureate; 9.1% master’s degree, and 0.6% doctorally prepared.

The most frequently expressed goal of critical thinking in nursing is the development of clinical competency. As the above numbers indicate, a significant portion of the nursing
workforce is comprised of associate degree prepared nurses. Because, as Miller and Malcolm (1990) state, “The ability to think critically is a requirement for nurses whose preparation is in all types of basic educational programs” (p. 67), more research should be conducted with associate degree nursing programs and students.

Speaking to the issue of critical thinking, L’Eplattenier (2001) describes what nursing, as a profession, needs to do:

…nursing needs to determine how critical thinking is articulated in the practice of all nurses at all levels from students, to novice, through expert. We need to observe it, feel it, and describe it, and perhaps, then we can discover and implement an appropriate methodology to measure and evaluate it. (p. 32)

Recommendations for Further Research

Several recommended areas of further research have resulted from this study. One such area is a definition of critical thinking contextualized to the domain of nursing. Currently, there is no agreed upon definition of critical thinking in nursing education; however, it is possible that programs of nursing would benefit from a clear, nursing-contextualized definition of critical thinking to guide instruction and assessment. An additional area which bears study is the identification of specific teaching strategies that promote the development of critical thinking skills. The empiric studies cited in this research provided little information about specific curricular content or teaching strategies utilized to teach critical thinking. Therefore, it is impossible to determine whether schools that did demonstrate an impact of nursing education on critical thinking were utilizing different strategies than those that did not. It is important to be able to identify what curricular content and which teaching strategies do actually promote the development of critical thinking skills.

Additional research into nursing faculty preparedness to teach critical thinking skills should be conducted. Faculty members are oftentimes, by virtue of their advanced degrees,
considered qualified to teach critical thinking. Research to verify the veracity of this assumption should take place.

Presently, the impact of nursing education on the development of critical thinking skills is unclear. Additional longitudinal studies using nursing-specific definitions and measurements of critical thinking skills should be conducted. Studies that utilized more than one measurement instrument could yield valuable information about the instruments and their ability to measure critical thinking in nursing. The findings of this study support a relationship between critical thinking, as measured by the Assessment Technologies Institute’s CTA instrument, and academic success, as measured by matriculation time and nursing course GPAs. This study also found that SAT-math scores and age were predictive of entry critical thinking composite scores. Further research into the relationship between critical thinking and these variables is warranted.

Additional studies examining critical thinking skills in associate degree nursing students should be conducted. As previously stated, much of the workforce and many nursing programs are at the associate degree level. While the shorter time frame of an associate degree program creates additional challenges to affecting changes in critical thinking skills, the NLN mandate to define, teach, and assess for critical thinking applies equally to these programs as well as to baccalaureate programs.

Summary

The findings of this study leave this researcher with more questions than answers. Perhaps that is appropriate in that research revealing what is not known can be as important as research revealing what is known. The literature search conducted for this study reveals inconsistencies in the way critical thinking is perceived, defined, operationalized, and measured by schools of nursing. Results of empiric studies, for the most part, are inconsistent and
demonstrate no strong support for any particular finding. Critical thinking is too crucial for these inconsistencies to be allowed to remain unresolved. The most significant finding of this study, in this researcher’s opinion, is the relationship between critical thinking skills and academic success in nursing.
REFERENCES


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Competencies Task Force. *Educational competencies for graduates of associate degree nursing programs.* Sudbury, MA: Jones & Bartlett


National League for Nursing (2002b). *Nursing education research priorities.* New York: Author


APPENDIX A

ASSOCIATE DEGREE CURRICULUM PLAN AND PLAN OF STUDY
### Core Curriculum Requirements*

<table>
<thead>
<tr>
<th>Mandaement</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Essential Skills</strong></td>
<td>6</td>
</tr>
<tr>
<td>ENGL 1101, English Composition 1</td>
<td>3</td>
</tr>
<tr>
<td>MATH 1101, Mathematical Modeling</td>
<td>3</td>
</tr>
<tr>
<td><strong>Institutional Options</strong></td>
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</tr>
<tr>
<td>PHIL 1110, Introduction to Ethics</td>
<td>2</td>
</tr>
<tr>
<td>CSCI 1100, Introduction to Computers &amp; Information Systems</td>
<td>2</td>
</tr>
<tr>
<td>PSYC 1030, Principles of Leadership</td>
<td>2</td>
</tr>
<tr>
<td>COMM 2110, Speech Communication</td>
<td>2</td>
</tr>
<tr>
<td><strong>Social Sciences</strong></td>
<td>12</td>
</tr>
<tr>
<td>HIST 1112, Modern World Civilization</td>
<td>3</td>
</tr>
<tr>
<td>HIST 2111, U.S. History, HIST 2112, U. S. History or POLS 1101, American Government</td>
<td>3</td>
</tr>
<tr>
<td><strong>Electives</strong></td>
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<tr>
<td>HIST 1111, World Civilization prior to 1500</td>
<td>3</td>
</tr>
<tr>
<td>HIST 2111 (if not taken above), U. S. History</td>
<td>3</td>
</tr>
<tr>
<td>HIST 2112 (if not taken above), U. S. History</td>
<td>3</td>
</tr>
<tr>
<td>SOCI 1101, Introduction to Sociology</td>
<td>3</td>
</tr>
<tr>
<td>PSYC 1101, Introduction to General Psychology</td>
<td>3</td>
</tr>
<tr>
<td>ECON 2105, Principles of Macroeconomics</td>
<td>3</td>
</tr>
<tr>
<td>ANTH 1102, Introduction to Anthropology</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 1101, Introduction to Geography</td>
<td>3</td>
</tr>
<tr>
<td>POLS 1101 (if not taken above), American Government</td>
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<tr>
<td><strong>Nursing Major</strong></td>
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</tr>
<tr>
<td>BIOL 2250 &amp; BIOL 2251 Anatomy &amp; Physiology I and II</td>
<td>8</td>
</tr>
<tr>
<td>BIOL 2280, Microbiology</td>
<td>4</td>
</tr>
</tbody>
</table>

*Guided Electives: 3 hours from one of the following:*

- SOCI 1101, Introduction to Sociology 3 hours
- PSYC 1101, Introduction to General Psychology 3 hours
Courses in Nursing Science  

First year:  
First semester:  NURS 1100, Basic Concepts Essential to Nursing Practice, 5 hours  
NURS 1020, Principles of Nutrition and Nutrition Therapy, 1 hour  

Second semester:  NURS 1110, Fundamental Concepts/Integrated Nursing Skills, 5 hours  
NURS 2070, Growth and Development Across the Life Span, 2 hours  

Second Year:  
NURS 2110, Care of the Psychiatric/Mental Health Client, 5 hours  
NURS 2130, Care of the Maternal/Child Client, 5 hours  
NURS 2140, Care of the Pediatric Client, 5 hours  
NURS 2160, Care of the Adult/Gerontologic Client, 5 hours  

Source: North Georgia College & State University, 2002-2004 Undergraduate Bulletin
APPENDIX B

THE DELPHI STUDY, DEFINITION OF SUBSKILLS
**Interpretation Subskills**

Categorization is the ability to appreciate and make distinctions with information and appropriately form categories which provide frameworks for understanding and applying meaning to information. Decoding significance is the ability to appreciate and describe the significance of the informational and emotional content expressed in a variety of conventional forms of communication, including but not limited to language and behaviors. Clarifying meaning is the ability to understand and articulate the meaning of words, concepts, statements, behaviors, and other forms of oral and written communication (Facione, 1990).

**Analysis Subskills**

Examining ideas includes defining terms, comparing or contrasting ideas, and the ability to identify issues or problems and their constituent parts. Detecting arguments is the ability to determine whether a given set of statements or questions supports or contests a particular opinion or point of view. Analyzing arguments is the ability to dissect a particular assertion, opinion, or point of view and identify its main conclusion, rationale in support of the main conclusion, underlying principles and chain of reasoning (Facione, 1990).

**Evaluation Subskills**

Assessing claims is the ability to identify the pertinent issues needed to assess the credibility and the contextual relevance of information, principles, and questions. Assessing arguments includes the ability to dissect premises and conclusions of a given argument and to determine the merit and/or strength of justifications used in reaching a particular conclusion (Facione, 1990).
Inference Subskills

Inference includes the ability to identify information and data necessary to draw reasonable conclusions and to form conjectures and hypotheses from that information and data. It also includes the subskills of querying evidence, conjecturing alternatives, and drawing conclusions. Querying evidence is the ability to recognize knowledge deficits, develop stratagems for acquiring needed information, and to judge the relative merits of alternative arguments. Conjecturing alternatives is developing multiple alternatives to situations and problems and to understand potential consequences of the multiple alternatives. Drawing conclusions is to formulate logical opinions, positions, or points of view given relevant information, statements, and descriptions (Facione, 1990).

Explanation

Explanation includes the ability to articulate one’s position and arguments and analysis used to determine that position. It includes the subskills of stating results, justifying procedures, and presenting arguments. Stating results is the ability to coherently articulate so as to accurately represent or describe a given position or opinion. Justifying procedures is to understand the evidential, conceptual, and other considerations used to form an opinion or interpretation. Presenting arguments is to provide rationale for one’s opinion or belief (Facione, 1990).

Self-Regulation

Self-regulation is to intentionally attend to one’s own cognitive activities and to analyze and evaluate one’s own inferential judgments. It includes the subskills of self-examination and self-correction. Self-examination is to reflect on one’s own cognitive processes and skills, to make a reflective and objective self-assessment of opinions and beliefs, to recognize when these
are influenced by knowledge deficits, emotions, or other factors which impede rationality. Self-correction is to correct misconceptions discovered through self-examination (Facione, 1990).
APPENDIX C

ASSESSMENT TECHNOLOGIES INSTITUTE CRITICAL THINKING ASSESSMENT
Critical Thinking Assessment

1. Assume that whenever spring is late, the birds and the bees are small and hungry. Based on this assumption, which statement must be true?
   A. If spring is not late, the birds and the bees are neither small nor hungry.
   B. If the bees are not small and the birds are not hungry, spring is not late.
   C. If the birds are hungry or the bees are small, then spring is late.
   D. If spring is late, either the birds are small or the bees are hungry.

2. An elderly woman has cancer and is given the option of receiving an experimental drug to treat the cancer or receiving pain medication to control excessive pain. The cancer treatment might extend her life for six months. However, the woman chooses to use the pain medication as needed. All of the following statements support the woman’s choice except:
   A. The woman’s cancer therapy may not lengthen life.
   B. The woman’s desire is to live a better quality of life for her remaining days.
   C. The woman wants to die without extraordinary medical intervention.
   D. The woman’s family wants her to receive the cancer treatment.

3. After a couple returns from an evening out, they drive the babysitter home. The next day, the wife discovers that her favorite bracelet is missing from her jewelry box. Which statement represents the most reasonable explanation of this situation?
   A. The wife forgot where she placed the bracelet.
   B. One of the couple’s children misplaced the bracelet.
   C. The babysitter took the bracelet.
   D. A conclusion cannot be made based on the evidence.

4. A high school biology student studied the effects of sunlight on plant growth for two months. Which method best illustrates the relationship of sunlight to plant growth?
   A. A panel discussion including botany experts.
   B. A pie chart demonstrating the effects of darkness on plant growth.
   C. A bar graph describing the weekly growth patterns.
   D. A videotape showing the daily plant growth.

5. Determine the next logical set of numbers: 17, 20, 22, 23, then:
   A. 33, 35, 36, 39
   B. 30, 33, 34, 37
   C. 28, 31, 33, 34
   D. 24, 26, 28, 30

6. Consider the following statement: “Not all the actors are ready for the play to open.” This statement expresses the same idea as:
   A. None of the actors are ready for the play to open.
   B. Someone ready for the play to open is not an actor.
   C. All of the actors are ready for the play to open.
   D. At least one actor is not ready for the play to open.

7. It has been said, “No one grows up in the same family.” An explanation for this saying is:
   A. Birth order and family circumstances influence each child’s experience.
   B. Children compete for their parents attention in every family.
   C. Parents are naturally biased and favor one child more than another.
   D. Depending on birth order, children have different personalities.
Critical Thinking Assessment

8. The harmful effects of long-term alcohol use are well documented. Which source of information best explains the harmful effects?
   A. Local hospital and physician reports
   B. Statistical data of the identified effects
   C. Coroner's reports for the last five years
   D. Insurance claims from a highly populated state

9. Police officers maintain the law. It is illegal to run a stoplight; therefore, police officers:
   A. never run stoplights.
   B. believe it is illegal to run a stoplight.
   C. consider stoplights important.
   D. may issue a ticket if you run a stoplight.

10. A woman reads a magazine article about high blood pressure. After talking with her mother, the woman realizes that her mother is experiencing the same symptoms that are described in the article. What is the best course of action?
    A. Wait for further signs and symptoms to develop.
    B. Seek medical guidance based on the signs and symptoms.
    C. Realize these may not be signs and symptoms of high blood pressure.
    D. Call the doctor and report that her mother has high blood pressure.

11. A school has seven classrooms: 1, 2, 3, 4, 5, 6, and 7. The principal must choose five students, each from a different classroom, to perform in a special play. Any combination of five students will be appropriate, except if a student from classroom 1 is selected, then no one from class 5 may be chosen. Also, if a student from class 3 is selected, then someone from classroom 5 must also be selected. If someone from classroom 2 is in the play, then a student from classroom 6 must also be selected. Which combination of students meets all of the criteria?
    A. 1, 4, 5, 6, 7
    B. 2, 3, 4, 5, 7
    C. 1, 2, 3, 4, 5
    D. 2, 3, 4, 5, 6

12. An advertisement reads: "Neutrasplash helps prevent lines and wrinkles. Look younger today." Which statement gives a critical evaluation of this advertisement?
    A. This advertisement clarifies that only those that want to look younger should buy the product.
    B. This advertisement gives several good reasons for purchasing the product.
    C. The phrase "helps prevent" eliminates any promises about the performance of this product.
    D. The name of the product indicates the product contains healthy ingredients.

13. A researcher collects information regarding the relationship of drinking orange juice and preventing the common cold. Which method would best assist the researcher in reaching a conclusion?
    A. Drink orange juice when a cold is coming on.
    B. Conduct a survey of those who drink orange juice to prevent a cold.
    C. Analyze the research data found in the scientific journals.
    D. Review the chemical composition of orange juice.

14. Building L is shorter than Building X. Building Y is shorter than Building L, but Building M is shorter than Building Y; therefore, Building Y is shorter than Building J. What premise must be added to require the conclusion to be true, assuming all of the premises are true?
    A. Building J is taller than M.
    B. Building J is taller than L.
    C. Building X is taller than J.
    D. Building L is taller than J.
Critical Thinking Assessment

15. A grocery clerk believes strongly in telling the truth; however, he lies to intruders who ask him where the store safe is kept. How could this contradiction be best explained? The grocery store clerk:
   A. was afraid of the intruders and feared for his life.
   B. wanted the intruders to leave quickly.
   C. obviously has very weak beliefs.
   D. believed strongly in his work responsibilities.

16. Fido and Spot are dogs. Assume whenever it is hot, Fido and Spot are lazy and quiet. Based on this assumption, which statement must be true?
   A. If it is hot, Fido is lazy and Spot is quiet.
   B. If Fido is quiet or Spot is lazy, it is hot.
   C. If it is not hot, Fido and Spot are neither lazy nor quiet.
   D. If Spot is lazy but Fido is not quiet, it is not hot.

17. Consider the statement: "If anything is a rose, then that thing smells sweet." Which of the following statements provides the best interpretation of the statement?
   A. One thing smells as sweet as a rose.
   B. If anything smells sweet, then it is a rose.
   C. Things don't smell sweet unless they are roses.
   D. Roses smell sweet.

18. In a scientific study of racehorses that were fed an iron rich diet for six months, 75% of the horses showed an increase in track speed within 90 days. That this improvement could have happened randomly or by chance was ruled out with a high degree of confidence. If the above statements are true, the study's statistical findings confirm:
   A. regulations regarding the type of dietary intake for racehorses should be enforced.
   B. the horses in the study were racehorses and the findings do not apply to horses in general.
   C. iron enriched feed is associated with an increased track speed in racehorses.
   D. regular, non-iron enriched feed causes decreased track speed in racehorses.

19. A newspaper advertisement states, "Only those seeking hard work and long hours should apply for this job." Which statement expresses the same idea?
   A. You should not apply for this job unless you seek hard work and long hours.
   B. If you seek hard work and long hours, you should apply for this job.
   C. You should not seek hard work and long hours except by applying for this job.
   D. If you apply for this job, you should seek hard work and long hours.

20. A man goes to the doctor's office complaining about severe headaches and seeing bright, flashing lights. The doctor orders several tests; however, all of the test results are normal. Which statement provides the best explanation?
   A. The man has many physical problems that cannot be explained.
   B. The man complains frequently and counseling is recommended.
   C. Even though the tests are normal, continual monitoring is needed.
   D. The signs and symptoms reported by the man are not real.

21. Read the following statement: "Only people seeking rest and relaxation should buy a boat." Which statement expresses the same idea?
   A. If people want rest and relaxation, they should buy a boat.
   B. People can only find rest and relaxation by buying a boat.
   C. People should not buy a boat unless they want rest and relaxation.
   D. If people buy a boat, they should seek rest and relaxation.
Critical Thinking Assessment

22. On a school playground, the teacher states, "Look at those children running one right after the other. They are so close together that if one of them stops, the next one will run into the other. So, if one stops, they all will fall down." Assuming the above statements are true, the main claim of the passage:
   A. is probably false, but could be true.
   B. is probably true, but may be false.
   C. could not be true.
   D. must also be true.

23. A congressional candidate you oppose writes a newspaper article proposing new air traffic control regulations. To draw a conclusion about the article, you would:
   A. consider your past experiences with the candidate.
   B. refute the opinions presented in the article.
   C. focus your attention on the argument being made.
   D. identify the personal importance of the regulation.

24. A person sits on a jury that is trying a case for someone suspected of murder. To make a decision about the guilt or innocence of the suspect, what should the juror consider?
   A. Personal experiences that relate to crime victims
   B. Open-mindedness to the evidence and to the law
   C. The background of the defense lawyer and the prosecutor
   D. The consequences of the jury's decision

25. Consider the following to determine the same pattern of letters. If ABCCBA, then:
   A. CBAABC
   B. ZXYXYZ
   C. JKLKJL
   D. MNOONM

26. The sky is full of clouds; therefore, it will rain today. Which statement best categorizes the reasoning of the speaker?
   A. Good. It cannot rain unless there are clouds.
   B. Faulty. The clouds may not be rain clouds.
   C. Good. When there are clouds, it always rains.
   D. Faulty. It may not rain until tomorrow.

27. Consider the statement: "All sick people should see a doctor. An elderly man is ill." Therefore, the man:
   A. should see a doctor.
   B. should see a doctor if he does not get well.
   C. is like most ill people.
   D. may not get well unless he sees a doctor.

28. A science student is watching a televised debate on the genetic cloning of animals. In order for the student to make a reasoned decision, the student must first:
   A. justify the opinions presented in the televised debate.
   B. accept the views of the most qualified expert.
   C. engage in a debate with others.
   D. consider all points of view.
Critical Thinking Assessment

29. Consider the following: 1) In ancient times, civilizations recorded their religious and cultural ideas and lifetime records in clay. 2) Both famous and common people were honored in clay. 3) In fact, most of what we know of ancient civilizations comes from studying the clay pottery. 4) All of the pots and bowls were made of clay. Assuming the preceding statements are true, statements two, three, and four:
   A. prove statement one conclusively.
   B. explain why statement one is false.
   C. describe all of the uses for clay.
   D. provide support for statement one.

30. Reflect on this statement: "A student received a 50% on a research paper; therefore, that student is a poor writer." The sentence best describes:
   A. an irrelevant explanation for the low score.
   B. one of the possible explanations for the student's score.
   C. a reason without a conclusion.
   D. the only valid explanation for the student's score.

31. The mayor of a city states, "The new highway project has divided our neighborhood. The people on the north do not speak to those on the south. The project has led to name-calling, bickering and hurt feelings. I think the new highway is a big mistake for this neighborhood." Assuming the supporting statements are true, the mayor's conclusion:
   A. could not be false.
   B. could not be true.
   C. is probably true, but may be false.
   D. is probably false, but may be true.

32. Consider this statement: "Exceptional students are neither arrogant nor lazy. If a student is not arrogant, he is humble." Which of the following must be true if both of the previous statements are true?
   A. If someone is an exceptional student, that student is lazy but humble.
   B. No humble students are lazy.
   C. Every exceptional student is humble and not lazy.
   D. Exceptional students are neither humble nor lazy.

33. You have had two difficult "blind dates" arranged by your best friend. Your cousin arranges for you to go out with a friend she thinks is perfect for you. Your best course of action is to:
   A. make the decision based solely on your past experiences.
   B. turn the date down.
   C. arrange to talk to the date by phone.
   D. accept the date enthusiastically.

34. An insurance company proposes a new health care policy that would guarantee health care coverage for all citizens. In order to assist policy holders in making a decision, which information should company representatives include in the explanation of the new health care coverage?
   A. The company's position statement regarding universal health care
   B. A pamphlet demonstrating the disadvantages of the other health care coverage
   C. The plan of how policy holders could support the new health care plan
   D. A statement showing evidence that the benefits will outweigh the costs
Critical Thinking Assessment

35. Reflect on this statement: "Ballet dancers are neither overweight nor clumsy. If someone is not overweight, then that person is graceful." Which of the following statements is true, if both of the above statements are true?
   A. Every ballet dancer is graceful and not clumsy.
   B. No graceful dancers are overweight.
   C. If someone is a ballet dancer, that person is graceful but clumsy.
   D. Ballet dancers are neither graceful nor clumsy.

36. A college student is enrolled in a nuclear physics class. On the first day of class, the instructor gives the student a reading assignment containing a long list of unfamiliar terms. In order to build a strong knowledge base, what should the student do?
   A. Ask a friend for help in understanding the terms.
   B. Define the terms prior to reading the assignment.
   C. Read the assigned material in an attempt to gain an understanding of each new term.
   D. Wait and see if the terms make sense in the next couple of classes.

37. Suppose a study of heroin users shows 70% had used marijuana before they tried heroin. The conclusion of the study states all marijuana users will eventually try heroin. This conclusion:
   A. is a hasty generalization.
   B. is an unclear assumption.
   C. needs no further support.
   D. is factual information.

38. In a debate regarding solutions to the rising costs of health care, several points of view are communicated. In order to make an informed decision about the issues, what should a consumer do?
   A. Determine why people have so many opinions.
   B. Consider the advantages and disadvantages of each solution.
   C. Realize that it is impossible to sort through so many viewpoints.
   D. Interview each person who has a different viewpoint.

39. A chef conducts a cooking class and states, "This frying pan allows for several cooking methods." Which statement is the best interpretation of this claim?
   A. All frying pans have several cooking methods.
   B. Not every frying pan uses the same cooking method.
   C. The same cooking method is used by several frying pans.
   D. There is a special pan that allows for two cooking methods.

40. A spokesperson for a car manufacturer states, "There are two popular arguments that favor the 55 miles/hr speed limit. First, it saves lives. Second, it saves wear and tear on the car. However, millions of people drive faster than the speed limit, and their cars show no signs of breakdown. So, I say, there is no sense to the 55 miles/hr speed limit." The speaker's reasoning is best evaluated as:
   A. good. It shows there is probably no way to increase auto safety.
   B. faulty. It did not show the importance of the car manufacturer's beliefs.
   C. faulty. It did not consider arguments about the speed limit saving lives.
   D. good. It proves that there is a relationship between speed and car breakdown.

End Of Test
APPENDIX D

INFORMATION SHEET FOR STUDENT PARTICIPATION AND CONSENT FORM
Consent Form

I, _______________________, agree to participate in this research study titled “Evaluation of Critical Thinking Skills in an Associate Degree Nursing Program’ which is being conducted by Jackie H. Jones, doctoral student at the University of Georgia, 770-793-5570, under the direction of Dr. Libby Morris, Department of Higher Education, University of Georgia, 706-542-0580. I understand that my participation is entirely voluntary; I can choose not to participate in this research study and no negative consequence will accrue; I can withdraw my consent at any time without penalty and have the results of my participation, to the extent that they can be identified as mine, returned to me, removed from the research records, or destroyed. Participation will not affect my course or clinical grade or evaluation, either adversely or beneficially.

The following points have been explained to me:

1. The purpose of this study is to evaluate the effectiveness of the curriculum and instructional strategies related to critical thinking.

2. The benefits that I may expect to receive from it are improvements in instructional strategies and curriculum related to critical thinking that result from this study.

3. The procedures are as follows:

As part of the normal assessment and evaluation process of the nursing department, students were administered a pre-test critical thinking examination in December 2002 during their first semester in the associate degree nursing program. As part of the normal assessment and evaluation process, students will be administered a post-test critical thinking examination near the end of Spring 2004 semester, their last semester in the associate degree program. This is a 40-question examination that will take approximately one hour to complete. Statistical analysis will be conducted on the pre-test data from December 2002 and post-test data and also on the pre-test data and the subjects’ end of program GPA.

For this study, you may be asked to complete a demographic questionnaire and allow researchers to access your end program grade point averages, high school grade point averages, and SAT scores. Completing this consent form and the demographic questionnaire should take approximately ½ hour or less of your time—this being the only activity that is part of the research study that is not a normal part of your coursework.

4. The discomforts or stresses that may be faced during this research are: No discomforts or stresses are foreseen.

5. Participation entails the following risks: No risks are foreseen.

6. The results of this participation will be completely confidential, and will not be released in any individually identifiable form without my prior consent, unless required by law.

7. The investigator will answer any further questions about the research, now or during the course of the Project, and can be reached by telephone at 770-793-5570.

My signature below indicates that the researchers have answered all of my questions to my satisfaction and that I agree to participate in this study. I have been given a copy of this form.

_______________________________       ___________
Name of Researcher         Signature                                                Date
Telephone:  770-793-5570
Email:  jhJones@ngcsu.edu

____________________________       _____________________________       ___________
Name of Participant                                  Signature                                                Date

PLEASE SIGN BOTH COPIES OF THIS FORM. KEEP ONE AND RETURN THE OTHER TO THE INVESTIGATOR.

Additional questions or problems regarding your rights as a research participant should be addressed to Chris A. Joseph, Ph.D. Human Subjects Office, University of Georgia, 606A Boyd Graduate Research Center, Athens, Georgia 30602-7411; Telephone (706) 542-3199, E-Mail IRB@uga.edu
North Georgia College & State University  
Dahlonega, GA  
Department of Nursing

Information Sheet for Student Participant

Educators have long recognized teaching students critical thinking skills is one of the most important purposes of education. Critical thinking skills have been identified by numerous leading nursing organizations as essential to the practice of nursing in the twenty-first century. It is an imperative of nursing education, in preparing students for practice in the twenty-first century, to teach critical thinking skills.

As part of the normal assessment and evaluation process at North Georgia College & State University, you were given a pre-test Critical Thinking Examination, published by Assessment Technologies Institute (ATI), in December 2002, during your first semester in the associate degree nursing program. As part of the same assessment and evaluation process, you will be given a post-test Critical Thinking Assessment (CTA) examination, published by ATI, near the end of Spring semester 2004. This data will be analyzed to determine if changes in critical thinking scores have occurred and to determine if relationships exist between CTA scores and program success.

All information gathered that relate to individual students will be kept confidential. All data will be reported in group form and no names will be used in any report.

The purpose of this study is to examine changes in critical thinking scores; to determine if a relationship exists between pre-test critical thinking scores, post-test critical thinking scores, and cumulative end-program grade point averages; to determine if a relationship exists between CTA scores, both pre- and post-test, and student background variables, such as high school GPA, SAT, gender, race, and age; and to determine if a relationship exists between pre-test CTA scores and persistence in the program.

This study has practical significance to this program and to the profession of nursing. The findings will allow this institution to determine whether the instructional strategies designed to teach critical thinking have been effective in doing so. This information also has the potential to reduce attrition in schools of nursing. If a relationship is found to exist between CTA scores and program success, the information can be used for early identification of students that may have remediation needs.

Thank you for participating in this study.
APPENDIX E

INSTITUTIONAL REVIEW BOARD APPROVAL, UNIVERSITY OF GEORGIA
**Title of Study:** Evaluation of Critical Thinking Skills in an Associate Degree Nursing Program

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Dept/Phone</th>
<th>Address</th>
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</tr>
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<tbody>
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</tbody>
</table>

**45 CFR 46 Category:** Administrative

**APPROVED FOR NORTH GEORGIA COLLEGE AND STATE UNIVERSITY.**


*NOTE:* Any research conducted before the approval date or after the end data collection date shown above is not covered by IRB approval, and cannot be retroactively approved.

**Number Assigned by Sponsored Programs:**  

**Funding Agency:**

**Form 310 Provided:** No

Your human subjects study has been approved as indicated under IRB action above.

Please be aware that it is your responsibility to inform the IRB...

... of any adverse events or unanticipated risks to the subjects or others within 24 to 72 hours; ...

... of any significant changes or additions to your study and obtain approval of them before they are put into effect; ...

... that you need to extend the approval period beyond the expiration date shown above; ...

... that you have completed your data collection as approved, within the approval period shown above, so that your file may be closed.

For additional information regarding your responsibilities as an investigator, refer to the IRB Guidelines.

For your convenience in obtaining approval of changes, extending the approval period, or closing your file, we are providing you with a blue Researcher Request form. Detach this blue form, complete it as appropriate, sign and date it, then return it to the IRB office. Keep this original approval form for your records.

Copy:  

Dr. Thomas Dyer

Christina A. Joseph, Ph.D.  
Chairperson, Institutional Review Board
APPENDIX F

INSTITUTIONAL REVIEW BOARD APPROVAL

NORTH GEORGIA COLLEGE & STATE UNIVERSITY
Institutional Review Board (IRB)
at North Georgia College & State University

Notice of IRB Review

To: Jackie Jones

Project title: Evaluation of critical thinking skills in an associate degree nursing program

Received: October 21, 2003

Reviewed: October 24, 2003

The IRB at North Georgia College & State University has reviewed your application and rendered the following decision:

_X_ Your proposal has been approved with no changes

___ Your proposal has been referred for a Full Committee Hearing
    (you will be contacted regarding meeting times)

___ Your proposal requires the following modifications:

Your approval is valid until October 24, 2004. Please contact the IRB if you make any substantive changes to your design.

Also, please contact me at 864-1890 or via e-mail at ssmith@ngcsu.edu if you have questions regarding this review.

\[signature\]
Stephen M. Smith, IRB Chair
\[signature\]
Date