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CRITICAL THINKING SKILLS AND LEARNING STYLES OF FIRST-YEAR
STUDENTS IN WEEKEND OCCUPATIONAL THERAPY PROGRAMS

by

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Chapter 1

Introduction

Background Information and Statement of Problem

In 1984, the Accreditation Council for Occupational Therapy Education of the American Occupational Therapy Association approved a new type of program to prepare individuals for professional careers as occupational therapists (OTRs). All course work in this unique program was scheduled on weekends. Interest in the nontraditional format grew, and by 1997, eight weekend occupational therapy educational programs in the U.S. had been awarded accreditation. Weekend programs were originally intended to provide a mechanism for career advancement for Certified Occupational Therapy Assistants (COTAs). These students had previous preparation in occupational therapy at the associate degree level, and wished to earn B.S. or B.S./M.S. degrees in order to practice at the professional level. However, colleges with weekend curricula received so many inquiries from adults with other backgrounds who were interested in becoming occupational therapists but needed to work full-time, that six programs have now opened their enrollment to students who are not COTAs. In most cases, these programs have established special admission requirements for applicants without training in occupational therapy. In order to qualify for admission to some weekend programs, individuals who are not COTAs must have previous baccalaureate degrees. Other programs require a higher pre-admission cumulative grade-point average (GPA) for non-COTA applicants, than for COTAs. Still others select from non-COTA applicants those who have certification and experience in health or human services disciplines (for example, therapeutic recreation specialists, special-education teachers, physical therapy assistants).

Educational outcomes for weekend occupational therapy students do not seem to be in question. Regardless of their backgrounds, most students selected for admission to these programs complete them successfully (Barry University, 1996; College Misericordia, 1997; Dominican College, n.d.). Graduates of weekend programs pass the Certification Examination for the Occupational Therapist at rates at or above the national average.

Developing curricula and selecting appropriate teaching methods for the unique and disparate student groups in weekend programs, however, can present a challenge. As Ciafalo, a new instructor in a weekend program, noted, "My concern was to find teaching models which would be effective for adult learners. What would allow these students to use their varied educational and life experiences while challenging them in the areas of clinical reasoning and critical thinking?" (1994, p.6). Faculty who lack information about similarities and differences in thinking and learning among weekend students may fail to meet individual needs. Almost all graduates of one weekend program contacted in a follow-up survey felt that non-COTA students had difficulty keeping up with their classmates (Barry University, 1996). A professor in another program described initial distrust between COTAs and students with previous baccalaureate degrees, with each group believing that the other had an advantage in the learning process (Hettinger, 1995). Some weekend programs have made efforts to address the issue of varied educational and occupational backgrounds among their students by assigning COTAs and non-COTAs separate curricular tracks, or by requiring additional foundational course work for non-COTAs (College of St. Catherine, n.d.; Mercy College, 1997-1998). Faculty in other programs, however, believe that diversity

among their students facilitates learning: "The mix of students, ranging in age from the early 20s to late 40s, has created a unique atmosphere that is one of the clear advantages of attending such a program. It is not uncommon to see members of this class reach across the barriers of age and lifestyle to work with and support one another" (Giberson, 1997, p. 18).

Neither national standards nor the professional literature provide direction for occupational therapy educators who need to understand the thinking skills and learning styles of nontraditional students. The Standards for an Accredited Educational Program for the Occupational Therapist delineate requirements for the curriculum content of professional programs, which include coursework that develops the students' ability to "employ logical thinking, critical analysis, problem-solving, and creativity" (The American Occupational Therapy Association, 1998, p. 9). The same standards are used to evaluate the curricula of programs for traditional students and those designed to build upon the previous experience of COTAs. No studies of thinking skills among adult, working students or students with previous preparation in the field have been reported in the occupational therapy literature. Very few studies of learning styles and occupational therapy education have included students at different educational levels or students with and without clinical experience (Katz & Heimann, 1991; Llorens & Adams, 1978; Rogers & Hill, 1980).

In nursing, however, concerns related to multiple educational levels within the profession have provided an impetus for research (Beck, Bennett, McLeod & Molyneaux, 1992). The National League for Nursing's requirement that baccalaureate programs measure and report their students' critical thinking skills has also encouraged the

collection of data. Several studies have examined differences in critical thinking skills among students who enter baccalaureate programs with and without previous diplomas or associate degrees in nursing. Significant differences have been found among groups; for example, students educated in universities tend to perform better than students with technical training, on standardized tests of logical thinking (Beck, Bennett, McLeod & Molyneaux, 1992). Interdisciplinary research also provides evidence that individuals with different occupational backgrounds and levels of experience prefer different methods of processing new information (Gable, 1988; Katz, 1991; Kolb, 1984). Learning theory suggests that faculty can help students learn more efficiently by adjusting teaching methods to match styles of thinking and learning (Smith & Kolb, 1996). Research with a small sample of American and Israeli occupational therapy students supports this view (Katz 1990).

Purpose of the Study

The purpose of this study was to determine the extent to which previous education and experience explained variability in the critical thinking skills (as measured by the Watson-Glaser Critical Thinking Appraisal, Form S) and learning styles (as measured by Kolb's Learning Style Inventory) of students in the first year of weekend professional occupational therapy programs. The findings of the study will enable educators in these programs to make informed decisions about curriculum development and instructional strategies. The specific research questions addressed were:

1. Does a combination of the factors that weekend programs use in selecting students for admission (degrees earned, cumulative college grade point average, occupation), explain more of the variability in students' critical thinking skills than any one factor alone?

2. Are nontraditional occupational therapy students like traditional students in learning style (more oriented to “doing” than to “watching” and more oriented to “feeling” than to “thinking”)?
3. How much of the variability in learning style among weekend occupational therapy students can be explained by a combination of the admission factors?
4. To what extent do attributes of weekend students (gender, age, native language, years of work experience) explain critical thinking skills and learning style?
5. Is grade in physics a more useful measure of academic success for research on the thinking and learning skills of occupational therapy students, than cumulative college grade point average?

Assumptions of the Study

The following assumptions were made in the design and implementation of the study:

1. Curriculum design and instructional strategies should be congruent with students thinking skills and learning styles, whenever practical.
2. Cumulative college grade point average (GPA) at admission to the occupational therapy program is a meaningful measure of academic ability regardless of the schools students attended.
3. Physics courses are more likely than other courses that students have taken prior to their first year in a weekend occupational therapy program, to systematically affect critical thinking skills.
4. Differences in the first year curricula of weekend programs do not systematically affect the critical thinking skills or learning styles of students.

5. A self-report instrument is an adequate measure of the learning style of college students.

Limitations of the Study

The major limitation of this study is that although many working adults (including COTAs) are enrolled in traditional weekday occupational therapy programs, findings cannot be generalized to them.

Definition of Terms

Terms which are used in a unique way in this report, or which may be unfamiliar to persons outside of the discipline of occupational therapy, are defined below:

Certified occupational therapy assistant (COTA): A graduate of an accredited program in occupational therapy assisting, who has completed three months of full-time fieldwork and passed a national certification examination. Educational programs designed to prepare occupational therapy assistants are located in community colleges or technical schools, and may be completed in one or two years.

Critical thinking: The definition on which the Watson-Glaser Critical Thinking Appraisal is based is used in this study: Critical thinking is the ability to define a problem, select pertinent information for the solution to a problem, recognize stated and unstated assumptions, formulate and select relevant and promising hypotheses, draw valid conclusions and judge the validity of inferences (Watson & Glaser, 1994).

First-year student: This term is used to refer to students completing their first calendar year of required coursework in the occupational therapy major, regardless of the length or level of the program attended.

Learning style: The definition on which Kolb's Learning Style Inventory is based

is used in this study: **Learning style** is the characteristic way in which an individual prefers to absorb and incorporate new information (Smith & Kolb, 1996).

Nontraditional program: Used interchangeable with "weekend program".

Nontraditional student: Definitions of this term vary in the literature (Kerr, 1998).

In this study, it is used to refer to students who are attending college on weekends, and who may be older than the typical age for college students, changing careers, working full-time and/or raising a family.

Occupational therapist (OTR): Graduate of an accredited baccalaureate or entry-level graduate program in occupational therapy, who has completed six months of full-time fieldwork and passed a national certification examination.

Traditional program: An occupational educational program in which classes are scheduled on weekdays, on a full or part-time basis.

Weekend program: An occupational therapy educational program in which all classes are scheduled on Fridays, Saturdays and Sundays.

Chapter 2

Review of the Literature

The Construct of Critical Thinking

The idea that a major goal of academic instruction is developing the student's ability to reason effectively about a question or problem, originated in liberal arts education and philosophy. Dewey proposed as early as 1910 that the business of education is to "ingrain into the individual's working habits methods of inquiry and reasoning appropriate to the various problems that present themselves" (in Watson, 1925, p. 3). By 1933, Dewey was using the term "reflective thinking" to refer to a mental process focused toward a conclusion, involving an orderly chain of ideas which have been examined for validity (p. 47). He explained that reflective thinking begins with a forked-road situation, in which an individual is presented with a dilemma and feels confusion or doubt. The individual must search for answers, which are suggested by a fund of relevant knowledge and experience with similar situations in the past. He must think critically about alternative solutions, weighing and testing them for evidence or proof. Dewey agreed with other theorists that learning to think occurs naturally during normal development, and that the capacity for abstract thought is not fully developed until adolescence. He stated, however, that the ability to think well does not develop automatically; it must be cultivated by adults who guide the individual toward systematic exploration beginning in early childhood. Dewey also discussed an issue which educators debate today: "The question is asked whether the ability to think gained in dealing with one situation or subject will prove itself equally efficient in dealing with another subject and situation. . ." (p. 67). His conclusion was that when a subject is very

technical and isolated from everyday experience, little transfer of training in reflective thinking skills will occur.

In 1941, Glaser published what may have been the first evaluation study of an educational program intended to teach thinking skills. He developed an instrument called the Watson-Glaser Tests of Critical Thinking with his thesis advisor, Goodwin Watson. Glaser administered the measure to four high-school English classes before and after they completed a series of lessons on logical thinking. The definition of critical thinking Glaser used in this research paralleled Dewey's description of reflective thinking, but Glaser was more specific in identifying the skills involved. He stated that in order to think critically, the student must be able to recognize problems, gather information, recognize unstated assumptions, interpret data, appraise evidence, evaluate arguments, draw and test conclusions, and render accurate judgements. The Watson-Glaser Tests consisted of statements and situations, some neutral and others related to controversial social, economic and political issues, followed by forced-choice responses. Scores were calculated for logical reasoning, inference, generalization and evaluation of arguments. Glaser concluded, based on a review of the literature and on the results of his own small study, that critical thinking is related to but different than general intelligence, and that reasoning skills can be improved in secondary school students. Both the term "critical thinking" and the revised Watson-Glaser instrument, which has been called "a benchmark against which others must be compared" (Norris & Ennis, 1989, p. 57), are widely used today.

In 1947, the development of critical thinking was established as a national goal for higher education in America, and an Intercollege Committee on Critical Thinking was

convened (Dressel & Mayhew, 1954). The operational definition of critical thinking which this group wrote provided further delineation of the skills involved. In this definition, the steps of the scientific method were applied to general problem-solving. The skills listed were defining a problem, selecting pertinent information for solution of a problem, recognizing stated and unstated assumptions, formulating and selecting relevant and promising hypotheses, drawing valid conclusions and judging the value of inferences. Members of the Committee reviewed and analyzed instruments for measuring abilities related to critical thinking (including the Watson-Glaser Tests). Then they developed a new instrument, which also required students to read scenarios; for example, an advertisement in which claims are made for a product or the results of a court case. Students then answered multiple-choice questions keyed to individual critical thinking skills. Committee members used the instrument in local evaluation studies; methodology was rather informal by current standards. One important conclusion was that critical thinking is moderately correlated with general intelligence, academic aptitude and grades in college courses. The Committee also concluded that gains in critical thinking scores after relevant course work are greatest in the first year or two of college.

By the 1980s, interest in reasoning skills had become so widespread among educators that some referred to a "critical thinking movement" (Facione, 1990, p. 1). Ennis was influential in expanding the definition of critical thinking in important ways, during this decade. Ennis proposed the following practical definition: "Critical thinking is reflective and reasonable thinking that is focused on deciding what to believe or do" (1985, p. 45). This perspective emphasized that critical thinking is more than analyzing arguments; it directs the actions people take for survival and success in everyday life

(Norris & Ennis, 1989). Ennis developed a list of 12 specific critical thinking abilities, organized under the categories of elementary clarification, basic support, inference, advanced clarification and strategy and tactics. He then attempted to delineate the relationship between critical thinking and creative thinking. Creativity has been defined in the psychology literature as divergent thinking (Guilford, 1967), and as thinking which has the characteristics of flexibility, fluency, originality and elaboration (Torrance, 1984). Ennis proposed that critical thinking overlaps with creative thinking when original products are carefully evaluated (for example, brainstorming hypotheses is simply a creative activity, but producing alternative hypotheses and selecting the best of them involves both creative and critical thinking) (Norris & Ennis, 1989). Finally, Ennis addressed "perhaps the most controversial issue within the critical thinking movement these days" (1989, p. 4), the question of whether reasoning skills can be learned separately from the content of a specific subject area. He reviewed the position of educators who use "the general approach"; teaching the principles of good thinking as a course, or in units or threads within a variety of courses. Ennis contrasted the general approach with the perspective of subject or domain specificity, which has many proponents in cognitive psychology. Variations of this perspective are that (1) thinking in a given domain depends upon background knowledge, and transfer of critical thinking skills from one subject to another is unlikely without explicit instruction and practice, (2) since each discipline has characteristic ways of reasoning, critical thinking can only be taught within the field, (3) since thinking is always about some content, "general" critical thinking skills do not exist. Ennis concluded that we do not have enough empirical information to resolve the controversy. In another publication, Ennis and a colleague

reviewed instruments for measurement of critical thinking skills (Norris and Ennis, 1989). They stated that there were only eight comprehensive critical thinking tests based on general knowledge available commercially. Three of these are appropriate for use with college students: The Watson-Glaser Critical Thinking Appraisal (Watson & Glaser, 1994), the Cornell Critical Thinking Test Level Z (Ennis & Millman, 1985), and the Ennis-Weir Critical Thinking Essay Test (Ennis & Weir, 1985). Norris and Ennis noted that standardized measures of critical thinking do not reward good thinking that is unconventional.

In 1990, the American Philosophical Association sponsored a systematic inquiry into the current state of critical thinking conceptualization and assessment. It resulted in a "statement of expert consensus" among professors and teachers of philosophy, education and social and physical science (Facione, 1990, p. 3). The Delphi Method of qualitative research, which involved several rounds of surveying and analyzing the opinions of 46 individuals nominated as experts by their peers, was used to develop the statement. One important conclusion of the Delphi panel was that disagreements about the parameters of critical thinking are inevitable: "CT is one among a family of closely related forms of higher-order thinking, along with, for example, problem-solving, decision making, and creative thinking. Unfortunately the conceptual overlaps and complex relationships among all the various forms of higher-order thinking have yet to be examined satisfactorily." (Facione, 1990, p. 13).

The panel developed the following definition of critical thinking: "We understand critical thinking to be purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation and inference, as well as explanation of the evidential, conceptual,

methodological, criteriological, or contextual considerations upon which that judgment is based" (p. 3). The panel's consensus about subject specificity was that, "While CT skills themselves transcend specific subjects or disciplines, exercising them successfully in certain contexts demands domain-specific knowledge, some of which may concern specific methods and techniques used to make reasonable judgments in those specific contexts" (p. 10). The Delphi group's report about commercially available assessment tools cited Ennis. It was noted that sections of several Education Testing Service and American College Testing Program instruments (including the Academic Profile Test and the Graduate Record Examination), also target logical reasoning and analytical thinking.

Critical Thinking and Health Professions Education: Nursing

The most direct application of the critical thinking concepts and measurement techniques developed in philosophy and liberal arts education to health professions education, has been in nursing. A requirement that curricula emphasize critical thinking has been included in the National League for Nursing criteria for accreditation of baccalaureate programs, since the 1980s (National League for Nursing, 1983). In order to meet current criteria for accreditation, baccalaureate programs must document their definitions of critical thinking, the methods they use to evaluate thinking, and outcomes related to the critical thinking of students. (Videbeck, 1997). This requirement, along with controversy about whether registered nurses with diplomas or associate degrees are as well prepared for professional practice as those with baccalaureate degrees, has generated a substantial body of research relevant to educators in weekend occupational therapy programs (Beck, Bennett, McLeod & Molyneaux, 1992). The standardized instrument used most frequently in nursing research is the Watson-Glaser Critical

Thinking Appraisal (WGCTA). Administration of its short form is very practical, and the technical manual provides normative data on nurse managers and educators (Watson & Glaser, 1994). Studies which concern relationships between the critical thinking skills of nursing students and their prior education and/or experience, include the following:

Polifroni (1981) administered the WGCTA and the Nursing Process Utilization Inventory (a standardized measure of ability to develop nursing care plans, based on two clinical situations), to 258 senior students in baccalaureate programs in New Jersey. Entire senior classes were included in the study, but approximately 40% of the students declined to participate. She used analysis of variance procedures to examine relationships between problem-solving ability and various types of baccalaureate curricula (upper division programs which admit only diploma or associate degree registered nurses, and attempt to build upon previous knowledge, and generic programs which admit students with or without previous training and provide liberal arts and basic nursing courses regardless of the individual's background). Students in generic programs had significantly higher scores on both measures, whether or not they were registered nurses. Polifroni concluded that upper division programs are not effective in developing problem-solving skills, and that professional education cannot be built upon a technical knowledge base. The findings of this study are questionable, however. Only a post-test was given, and significant differences in the high-school achievement levels of the students in generic versus upper division curricula were not controlled.

Scoloveno (1981) studied problem-solving skills among senior nursing students in three types of educational program (hospital-based, associate degree and baccalaureate degree), also using the WGCTA and the Nursing Process Utilization Inventory (Sparks,

1979), a convenience sample of classes from schools in New Jersey, and analysis of variance procedures. She found that critical thinking scores varied significantly with level of education (baccalaureate students performed better than associate degree students, who performed better than hospital-based students). Baccalaureate students also had significantly higher scores on the measure of clinical problem-solving, than either of the other groups, but results for the technical and associate degree students were mixed. Again, only a post-test was administered, and significant differences in general academic ability among students in the three types of program (indicated by rank in high-school class) may have confounded the findings.

Gross, Takazawa and Rose (1987) administered the WGCTA to 37 associate degree and 34 baccalaureate students, at entry to and exit from the nursing program at the University of Hawaii. Analysis of variance and regression analysis procedures were used to examine relationships among critical thinking scores and a variety of variables including scores on the licensing examination for registered nurses. Critical thinking improved during the course of the nursing program, for both groups. GPA was the most important predictor of scores on the licensing examination. A positive correlation was found between age and examination scores, and between Caucasian ethnic background and examination scores (students from other backgrounds were more likely to have difficulty with verbal skills in English).

Sullivan (1987) administered the WGCTA, along with a measure of creative thinking and ratings of clinical performance, to a group of 46 students at entrance to and exit from a baccalaureate nursing program. The program accepted only students with previous diplomas or associate degrees in nursing, who were licensed to practice as

R.N.s. She used t-tests and Pearson's product moment correlations to analyze the data. The nurses with more years of experience entered the program with higher critical thinking scores than their classmates. Neither critical thinking nor creative thinking improved during the educational process, but the group's clinical skills did improve significantly.

Kintgen-Andrews (1988) used the WGCTA to study the development of critical thinking skills among four groups of students during one academic year. Her subjects were a convenience sample of 55 practical nursing students, 55 associate degree nursing students, 38 pre-health science freshman university students, and 29 sophomores in a generic baccalaureate nursing program. The WGCTA was administered in the fall and again in the spring of the year. Gain scores and simple correlation coefficients were computed between the two sets of scores and between the scores and various student characteristics. None of the groups made significant gains in critical thinking during the year, but significant positive correlations were found between critical thinking and age, and critical thinking and number of college credits completed, for some groups. Critical thinking scores were negatively correlated with amount of experience in nursing, in some cases. Unfortunately, sampling bias complicates the interpretation of these results.

Ircink (1989) investigated the relationships of selected student characteristics and curriculum models to critical thinking as measured by the WGCTA. She administered the instrument to 299 volunteers from the senior classes of 11 of the 12 accredited baccalaureate nursing programs in Wisconsin. Twenty-seven percent of the students were registered nurses with diplomas or associate degrees. Using analysis of variance procedures, Ircink found no difference among five curriculum models, in terms of impact

on students' critical thinking, and no difference between R.N. and traditional students. GPA was the only student characteristic significantly related to critical thinking scores.

Miller (1992) used a one-group pretest-posttest design to investigate the impact of a baccalaureate completion program for registered nurses, on critical thinking. The WGCTA was administered during the first course in the nursing major and again during the last course in the major, to the entire group of 137 students. Pearson product moment correlations and t-tests were used to analyze the data. Miller found significant gains in scores on the Recognition of Assumptions and Deductions subtests of the WGCTA. She also found that students whose previous preparation was at the diploma level entered with lower critical thinking scores and made greater gains than students with associate degrees. Posttest scores on the measure of critical thinking were significantly related to GPA earned in the nursing program.

Thinking in Occupational Therapy: Clinical Reasoning

Leaders in occupational therapy suggested as long ago as the 1960s that therapists needed skills in "a specific form of critical thinking", to plan intervention for patients whose ability to carry out work and play roles was affected by disease or disability (Line, 1969, p. 308). Early discussions about thinking in occupational therapy were influenced by theories of decision-making in medicine, which proposed that physicians selected and weighed alternative explanations for the signs and symptoms of illness, to arrive at a diagnosis. Since the decision-making process was believed to be linear and based on formal logic, theorists attempted to represent it with mathematical and statistical models such as regression equations and utility models (Weinstein, et al., 1980). In occupational therapy, Reilly developed a mathematical formula for critical-analytical thinking in

occupational therapy (1960). Day (1973) was among the authors who presented decision-trees and systems diagrams to delineate the steps in selecting appropriate principles and methods for occupational therapy intervention.

Currently, the term "clinical reasoning" is used to refer to the thinking process underlying clinical practice in occupational therapy and other health-related disciplines, including medicine, nursing, social work and physical therapy (Higgs & Jones, 1995). A team of researchers with backgrounds in education, psychology and medicine, led by Elstein, Shulman and Sprafka, is credited with pioneering the study of clinical reasoning in its current form (Patel & Arocha, 1995). One of the goals of this group was "to connect medical reasoning with other areas of cognitive psychology" (Elstein, Shulman & Sprafka, 1978, p. 273). They based their research on Newell and Simon's information-processing theory of problem-solving (1972), and used methodology introduced by de Groot (1965) in studies of the reasoning of chess masters. The subjects were experienced internists and medical students, who were observed and questioned as they solved a variety of (primarily diagnostic) problems presented on paper and in films. Elstein and his colleagues concluded that physicians use a four-stage model of inquiry to solve medical problems. In the first stage (cue acquisition) the clinician collects relevant items of information about the patient's discomfort. Then several hypotheses about the relationships between the cues and some underlying process are generated (hypothesis generation). Next, the clinician examines the congruence between sets of cues and each hypothesis, and collects additional data if necessary (cue interpretation). Finally, the most viable hypotheses are evaluated for plausibility and importance, and the diagnosis determined (hypothesis evaluation). This process of generating hypotheses early in the

medical workup and using them to guide the search for a solution is called the hypothetico-deductive method; Elstein states that it is psychologically necessary because it transforms a complex, unstructured problem into a structured problem which can be solved efficiently (1995).

By the mid-1980s, some writers were criticizing the hypothetico-deductive method as an explanation for the thinking of skilled practitioners. As Dreyfus and Dreyfus noted, "Experts don't solve problems and don't make decisions; they simply do what experience has shown normally works, and it normally works" (1996, p. 42). The philosopher, Schön, (1983) introduced the term knowing-in-action, to refer to the direct, spontaneous reasoning of an individual who is drawing from a repertoire of experience, rather than applying scientific methods of inquiry. Patel, Norman and others described problem-solving through pattern recognition (Groen & Patel, 1985; Schmidt, Norman & Boshuizen, 1990): When a clinician encounters a patient who resembles other patients he or she has known, a rapid, accurate process of matching or comparing to prototypes stored in the memory seems to occur. In her report of a 6-year study of 130 critical care nurses, Benner (1996) attributes pattern recognition to intuition (a perceptual grasp of the whole situation). Others have proposed that experienced clinicians see what needs to be done because they organize and retrieve cues or chunks of information more efficiently than beginners can (Groen & Patel, 1985; Bordage & Lemieux, 1991). Many investigators in this area believe that when experts are faced with complex and novel situations, they return to systematic problem-solving strategies. Schön argues, however, that experienced practitioners reflect on the similarities and differences between unfamiliar situations and those in their repertoire, and build new variations into their

patterns of understanding and action (1987).

Interest in clinical reasoning in occupational therapy was stimulated when Rogers spoke about Schön's work, and about the need for research on "the process of knowing and understanding that underlies practice", at the Annual Conference of the Occupational Therapy Association in 1983 (Rogers, 1983, p.602). A two-year ethnographic study (the Clinical Reasoning Study) funded by the professional association and conducted in the occupational therapy department of an acute care hospital, led to the establishment of the Institute for the Study of Clinical Reasoning in Occupational Therapy, at Tufts University in Boston (Mattingly & Gillette, 1991).

The term "procedural reasoning" was introduced in reports from the Clinical Reasoning Study, to identify the thinking process that occupational therapists used as they defined their patients' problems with performing everyday tasks, and selected procedures for intervention. Fleming reported that procedural reasoning was similar to problem-solving in medicine; for example, the occupational therapists she studied used the hypothetico-deductive method and pattern recognition (Fleming, 1991a; Mattingly & Fleming, 1994). She and her colleagues found, however, that clinical reasoning among occupational therapists also involved psychological processes not typically addressed in studies of medical problem-solving (creative thinking, value judgement, narrative) (Fleming, 1991b; Mattingly, 1991). Roberts (1996) is among those who have proposed that clinical reasoning in occupational therapy may simply appear to differ from reasoning in medicine, because the nature of the problems addressed is different (i.e., functional problems are less structured than diagnostic problems, occupational therapists view the patient holistically while physicians focus on the body).

Research on the Relationship of Clinical Reasoning to Critical Thinking

Investigation of the relationship between clinical reasoning and critical thinking has been complicated by disagreement about the nature of clinical reasoning, and by the lack of valid, reliable measures of clinical problem-solving (Beck, S., Bennett, A., McLeod, R. & Molyneaux, D., 1992). Tanner reviewed three studies of nursing students, in which no relationship was found between subjects' performance on tests of logical thinking (the WGCTA, the Miller Analogies Test) and their performance on measures of clinical judgment (written case studies, diagnostic problems). She concluded, "It is likely that the kind of reasoning tested by these standardized measures differs from that used in clinical judgment" (1986, p. 27). Norman and Schmidt cite studies of medical students which show consistently low correlations between scores on diagnostic problems in different areas of clinical practice (for example, performance on a problem in dermatology does not relate to performance on a problem in internal medicine). They state that this case specificity is evidence of "the fallacy in the notion that general fundamental cognitive skills can be acquired from a course in Latin, logic, or lateral thinking and then used to solve broad classes of problems in other fields" (1992, p. 560).

In contrast, there is evidence that critical thinking does predict success on the licensing examination for registered nurses, which is designed to measure the candidate's ability to plan, implement and evaluate in clinical situations. Bauwens and Gerhard (1987) reported the results of a longitudinal study of 159 students in one baccalaureate nursing program. The WGCTA was administered during the first and last terms of the program, and other data were collected from the students' records. Relationships among variables including critical thinking scores, scores on the licensing examination taken

after graduation (the NCLEX), and GPA were examined using multiple regression analysis. Twenty-two percent of the variance in the NCLEX scores was explained by critical thinking scores at entrance to the program together with GPA; this finding was significant at the $p < .01$ level.

Effects of Age and Experience on Clinical Reasoning and Critical Thinking

Current explanations of the clinical reasoning process in occupational therapy are based in part on theories about the cognitive development of adults, which originated in psychology (Bridge & Twible, 1997). Theories about postformal thinking, crystallized and fluid intelligence and pattern recognition have important implications for research on the thinking skills of nontraditional occupational therapy students.

Rybash, Hoyer and Roodin (1986) suggest that Piaget's description of biologically based stages in cognitive development does not account for thinking in adulthood. According to Piaget (1972), the most advanced stage of cognitive development (formal operations) is usually reached in adolescence. Individuals at the level of formal operations can think about abstract problems, and typically solve them systematically, by generating and testing hypotheses, considering implications, and constructing explanations. Some studies have shown that performance on formal operational tasks declines in adulthood. Rybash and colleagues propose the explanation that adults use a different type of thinking, which they call postformal. Postformal operational thinkers solve problems by considering the context of the situation. Arlin (1984) and Labouvie-Vief (1985) are among those who have tested this theory by presenting story problems to people of different ages. They report that (traditional-age) college students are much more likely to produce solutions based on formal operational

thinking, while older individuals suggest alternate possibilities which take into account emotional, interpersonal, socioeconomic and other factors.

Horn (1982) studied adults aged 20 to 60, to determine whether predictions could be made about age and two types of intellectual ability proposed by R. B. Cattell. He concluded that fluid ability (cognitive processing related to perceiving relationships, forming concepts and solving problems) is used when the individual encounters a novel situation, and it begins declining after adolescence. Crystallized ability (application of previously learned knowledge and skills) is related to intensive education and acculturation, and it increases with age.

Researchers in the health professions, including occupational therapy (Fleming, 1994; Robertson, 1996), have found that experienced and novice clinicians use different processes to solve clinical problems. Beginners are more likely to use hypothetico-deductive reasoning, while experts use pattern recognition.

Studies of differences in the thinking of experienced practitioners and beginners in occupational therapy have focused exclusively on individuals at the professional level of practice. Early (1993, p. 231) notes, "The role of the occupational therapy assistant in the clinical reasoning process has not been addressed in the literature. This is unfortunate, as the assistant is positioned close to the patient in the treatment situation. . . ." National standards for the roles of personnel in occupational therapy (American Occupational Therapy Association, 1994) indicate that it is the OTR who makes decisions about occupational therapy services while the COTA assists and implements. Survey data support the assumption that higher-order thinking is a more important aspect of practice at the professional level. Black (1997, p. 14) reported the

results of a national survey in which a stratified random sample of 7,000 OTRs and COTAs were asked to describe their work: "Some differences showed up in the areas of knowledge and skill. For COTAs 'doing' words, such as carry out and implement, were prevalent. OTRs used 'thinking' words, like formulate, design, and integrate." The national standards do recognize, however, that "individuals develop varying degrees of expertise in role performance" (American Occupational Therapy Association, 1994, p.5), and that COTAs may solve problems more independently as they gain experience.

Learning Style and Occupational Therapy Education

As Brookfield has noted, one of the most important ways in which teachers can help adult students become critical thinkers is by becoming familiar with students' personal styles and patterns of learning (1987). Keefe states that educators must "base programs on the significant differences that exist among learners rather than on the assumption that everybody learns in the same way. . . . Learning style diagnosis opens the door to personalizing education on a rational basis" (1987, p. 42).

Many theoretical models of learning style have been proposed, and their authors define and measure the construct in different ways (Dunn & DeBello, 1981). A broad definition developed by the National Association of Secondary School Principals is often cited: "Learning styles are characteristic cognitive, affective, and physiological behaviors that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment" (Keefe, 1987, p. 5). The cognitive and affective aspects of learning style, as viewed by Canfield and Lafferty (1970), Kolb (1984), Myers and Briggs (1985), Rezler and French (1975) and Torrance and Reynolds (1980), have been addressed in studies of occupational therapy students enrolled in traditional

professional programs.

Rezler and French (1975) compared the learning preferences of undergraduate students in six health-related programs (including occupational therapy) at The University of Illinois, using a self-administered Learning Preferences Inventory constructed for the study. Six dimensions of learning preference were measured: Abstract (preference for learning concepts and principles), concrete (preference for learning tangible, practical tasks), individual (preference for working alone), interpersonal (preference for working and learning with others), student-structured (emphasis on autonomy and self-direction), and teacher-structured (preference for well organized teacher-directed classes). The investigators found that all groups preferred to learn practical skills in a course well structured by the teacher.

Llorens and Adams (1978) administered the Canfield-Lafferty Learning Styles Inventory (1970) to 55 undergraduate and 22 graduate occupational therapy students beginning their course work at the University of Florida. This self-report instrument focuses on four affective variables in the teaching-learning situation: Conditions of learning (relations with instructor and peers, organization and detail, opportunity for independence, competition and discipline), content (working with logic, language, things or people), mode (listening, reading, viewing, direct experience), and expectation (anticipated level of performance). Descriptive techniques were used to analyze the data; the scores of graduate and undergraduate students were not compared. The researchers concluded that the students favored knowing their teacher personally, working alone and independently, studying content related to people, and learning through direct experience.

Rogers and Hill (1980) used a pretest-posttest design to study the learning style preferences of two classes of undergraduate and graduate students (n=89) grouped together in the occupational therapy curriculum at the University of Southern California. The measure was the Canfield-Lafferty Learning Style Inventory. Group t-tests were used to analyze differences between undergraduate and graduate students in the two classes, and paired t-tests to test for change from the beginning to the end of the curriculum. Learning style preferences of high-achievers (as indicated by GPA and score on the fieldwork report for students' first internship) and low-achievers were also compared. Findings related to change during the educational process and to differences between high and low achievers were inconclusive. The study did, however, provide additional evidence that occupational therapy students in general prefer learning experiences which are structured by the teacher, related to people (rather than ideas, numbers, objects, etc.), and focused on practical skills (rather than on theories or principles).

Gable (1988) administered a modified form of the Myers-Briggs Type Indicator to a stratified sample of 1187 first-year students enrolled in post-secondary health occupations programs in Indiana. Forty-two occupational therapy students were included, along with students in 14 other disciplines (medical assisting, physical therapy, respiratory therapy, etc.). The Myers-Briggs instrument (Myers & McCaulley, 1985) is based on Carl Jung's theory of psychological types, in which the individual's style of dealing with the world is reflected in four preferences (extraversion versus introversion, sensing versus intuitive, thinking versus feeling, judging versus perceiving).

Psychological type is believed to affect responses in many areas of life, including the way

in which students learn. Gable used t-tests to compare mean scores of students in the 15 occupational groups. She found that the occupational therapy students had a stronger preference for feeling than any other group: Individuals who prefer feeling come to decisions by weighing their own values and the values of others, rather than by making objective, logical connections. Gable also found that occupational therapy students were less likely than most other groups to have a judging attitude (oriented to planning, organizing, seeking closure).

Recent research with occupational therapy students has used Kolb's Learning Style Inventory (LSI) as the measure of learning style. This instrument is based on the propositions that people learn through experience, and that the process is a four-stage cycle: 1) Immediate or concrete experience 2) is the basis for observations and reflections 3) which are assimilated and distilled into theories or concepts 4) which can be tested and serve as guides in creating new experiences (Smith & Kolb, 1996). Kolb's inventory identifies an individual's favored mode of perceiving new information: Learners with high scores in Concrete Experience or "feeling" tend to sense their way in new situations based on relationships with people and on life experience, while learners with high scores in Abstract Conceptualization (thinking) rely on ideas and logic. The inventory also determines the individual's choice for processing information: Active Experimentation (doing) characterizes learners who prefer to get involved and cause change, while Reflective Observation (watching) characterizes those who prefer to discover meaning by considering information from a variety of perspectives. People are believed to combine the four modes of perceiving and processing information in characteristic ways, which identify them as convergers, divergers, assimilators, or accommodators. Kolb states that

two of the most important factors in shaping an individual's learning style are academic training and occupation. He believes that style remains moderately stable, but not fixed, throughout the adult years. Kolb has found small but significant differences in the learning styles of men and women (more women are concrete learners, more men are abstract learners).

Cahill and Madigan (1984) administered Kolb's LSI and the Rezler-French Learning Preference Inventory to 37 occupational therapy students as they began and ended their junior year at the University of Illinois. The researchers hypothesized that an instructional program which included small-group, tutorial and laboratory experiences in addition to traditional lectures, would influence students' learning preferences. Paired sample t-tests were used to compare pretest and posttest scores on the two measures. Cahill and Madigan concluded that the year of course work did not affect learning style. They noted that the sample was relatively diverse in age (students' ages ranged from 19 to 50 with a mean of 23.6), but relationships between learning style and age were not investigated.

Stafford (1986) studied relationships between the learning styles of 33 occupational therapy students at the University of Puget Sound, and their performance in fieldwork. Kolb's LSI was administered in the first semester of the students' professional program. Torrance and Reynolds' (1980) Your Style of Learning and Thinking (SOLAT) was administered during the final fieldwork assignment at the end of the program. The SOLAT is a 40-item self-administered test. Each item presents the subject with three choices that represent cognitive styles characterized by right hemisphere domination (intuitive approach to processing information), left hemisphere domination (logical,

sequential, systematic approach), or integration of hemispheres. Pearson product-moment correlation coefficients and regression analysis procedures were used to analyze relationships between scores on the learning style instruments and scores on the performance reports from students' fieldwork assignments in mental health and physical disabilities. The LSI Active-Reflective score was found to be the best predictor of performance in physical disabilities fieldwork (students who emphasized "doing", rather than "watching", received the highest ratings from their clinical supervisors).

Katz (1990) used Kolb's LSI in related studies of occupational therapy students in the U.S. and Israel. Her hypothesis was that students whose learning style matched the instructional strategy used in a required course would need less time for study outside of class and would perform better on a measure of clinical problem-solving, than students who were mismatched with instructional methods. She used quasi-experimental designs: 44 students at the University of Southern California and 50 students at the Hebrew University of Jerusalem were divided into subgroups of active versus reflective learners based on their LSI scores. Students were then randomly assigned within the subgroups to two teaching methods (lecture or student-directed group discussion). T-tests and analysis of variance procedures were used to compare the means of the groups treated with different teaching methods. Pearson correlation coefficients were computed for all variables, including GPA and scores on a measure of verbal ability. Multiple regression procedures were used to analyze the effects of learning style, GPA and verbal ability on examination scores and time spent studying. Findings in both countries supported the hypothesis: Reflective learners placed in a lecture class solved the clinical problem more effectively and needed less time to learn, and active learners performed better when

placed in the group discussion class. Other relevant findings based on the Israeli sample were: 1) Time spent studying outside of class and achievement in class were related to speaking English as the native language; 2) Matching was as effective for a group of 20 students who were registered occupational therapists completing their Bachelor's degrees as it was for traditional students (a baccalaureate degree is not required for practice as an occupational therapist in Israel).

Katz with Heimann (1991) also investigated differences in learning style among 629 first-year students and practitioners in five health professions in Israel (occupational therapy, social work, nursing, physical therapy and clinical psychology), using Kolb's LSI. Descriptive techniques, t-tests and analysis of variance were used to identify patterns among the disciplines. The means of occupational groups and of students versus practitioners within each discipline were compared. Occupational therapy students were found to be the most concrete of all the student groups: They were oriented to real-life applications and active involvement in learning, rather than to observation or scientific thinking. Katz noted that students sometimes differed in learning style from practitioners in the same disciplines. Practicing occupational therapists were concrete learners, but their preference for this mode of learning was not as strong as that of occupational therapy students.

Summary of the Literature Review

Definitions of critical thinking vary in their scope, but there is some consensus in the literature that the term refers to higher-order thinking processes based on logic and general knowledge. Relationships between critical thinking and other good thinking (for example, creative thinking) and between general critical thinking and discipline-specific

thinking (for example, clinical reasoning), have been proposed but not adequately tested by research. Critical thinking has traditionally been measured with standardized multiple choice tests. The Watson-Glaser Critical Thinking Appraisal (WGCTA) is the oldest and most thoroughly studied of these instruments, and the only one which includes normative data for health professionals (nurses). It has been observed that the forced-choice format of the WGCTA and other standardized tests of critical thinking rewards conventional, rather than divergent thinking.

Although preparing good critical thinkers for leadership roles in the profession is a goal of occupational therapy education, no data has been published about the critical thinking skills of occupational therapy students. Studies of nursing students with diverse backgrounds indicate that individuals who enter professional programs with more years of higher education and better grades tend to be stronger critical thinkers. In one study, students initially trained at the technical level entered a baccalaureate curriculum with lower critical thinking scores, but because they made more gains, these students were performing as well as their university-educated peers by the end of the professional program. Theories of adult cognition, and research with students and practitioners in the health professions, suggest that nontraditional students (those who are older or more experienced, or foreign-born) may perform differently than their traditional classmates on standardized tests of thinking skills. In some studies, age and experience have been an advantage, while in other studies, they have been associated with lower test scores.

Experts in adult education have proposed that good thinking can be facilitated by teachers who understand their students' learning styles. Learning style can be viewed as the characteristic way in which an individual perceives and responds to new information.

Learning style is believed to be shaped by academic training and occupation, and to remain relatively stable (but not fixed) in adulthood. Gender differences have also been found to affect learning style. Kolb's Learning Style Inventory was developed specifically to measure the learning styles of adult students in professional programs. It is a self-report instrument which identifies the student's preferred learning mode, relative position on dimensions of abstract to concrete and active to reflective learning, and learning style type. Kolb's LSI has been used more than any other instrument in research with occupational therapy students. The results of learning style research (most of which was completed in the 1980s) have been very consistent across samples from various occupational therapy programs in the U.S. and Israel. Students in occupational therapy are traditionally oriented to learning about people (instead of ideas, numbers, objects), and to solving problems by weighing values rather than by using logic. They prefer to learn practical skills and to be actively involved in the learning process. In terms of Kolb's learning modes, traditional occupational therapy students are "feelers" (they learn through concrete experience). They prefer the learning style type which Kolb calls accomodator (accomodators are hands-on learners). Interdisciplinary studies have shown that occupational therapy students differ from students in other health-care fields, in learning mode and style type. The very limited research comparing students and practicing professionals suggests that learning style may shift with work experience. Two studies with small samples support the hypothesis that matching teaching methods with learning styles may enable occupational therapy educators to help students succeed in course work and fieldwork.

Chapter 3

Methodology

Procedures

Design.

The objective of this study was context evaluation of weekend occupational therapy programs. Stufflebeam (1971, p. 268) defines context evaluation as serving planning decisions in education, by "identifying unused opportunities and underlying problems which prevent the meeting of needs". The study described and explained the thinking skills and learning styles of first-year students enrolled in these programs, to provide a basis for decisions about curriculum design and teaching methods. A regression design was used, since the focus was on determining "the degree to which two or more variables covary in an intact, naturally occurring group of subjects", and not on establishing causal relationships (Keppel & Zedeck, 1989, p. 383).

The X (independent) variables of primary interest were three factors that weekend occupational therapy programs use when selecting students for admission and assigning them to tracks within the curriculum (degrees earned, cumulative college GPA, occupation). The control variables were attributes of students which previous research has shown to be related to critical thinking or learning style (gender, age, native language, years of work experience), and grade in physics course (because studies in physical therapy have found it to be a better predictor of academic success than cumulative GPA). The two Y (dependent) variables were critical thinking as measured by the Watson-Glaser Critical Thinking Appraisal, and learning style as measured by Kolb's Learning Style Inventory.

Population and sample.

The target population of the research was current and future students in the first year of occupational therapy educational programs which prepare Certified Occupational Therapy Assistants (COTAs) and other working adults for certification at the professional level. The accessible population was first-year students enrolled in the seven weekend programs which had been granted continuing accreditation by the Accreditation Council for Occupational Therapy Education of the American Occupational Therapy Association at least once as of the 1997-98 school year.

The total accessible population was recruited as the sample for the study. Potential subjects were all 230 students enrolled in required first-year courses in the seven programs during the spring and summer of 1998. Power analysis indicated that with eight independent variables, a sample size of 114 was necessary to have an 80% probability of correctly rejecting the null hypothesis at the .05 significance level, using a "medium" effect size of .15 (Cohen & Cohen, 1975, p. 151).

Settings.

The seven weekend occupational therapy curricula were located in Florida, Minnesota, Ohio, New York and Pennsylvania. Six of the programs were offered in private liberal arts colleges with religious traditions. Minimum GPA for admission to the programs varied from 2.5 to 3.0, and the some of the programs had additional admission criteria for applicants who were not COTAs. Students entered the five programs at various levels (as transfer students at the junior level, as second bachelor's students, etc.), stayed for either two or three years, and graduated with different entry-level degrees (B.S. or B.S./M.S.). The curriculum sequence, however, was very similar in all schools:

Prerequisite lower-division course work in the arts and sciences was followed by a semester or year of upper division foundation courses (kinesiology, neuroanatomy, medical conditions, overview of occupational therapy), which was followed by upper-division courses in the theory and practice of occupational therapy. Students typically carried a full credit load of classes which met all day on several weekends each semester; students admitted in the same semester/year moved through upper division courses as a group.

Data collection.

The concept of the study was introduced to weekend program directors at a luncheon during the national Occupational Therapy Program Directors Meeting in Phoenix, in November, 1997. After the meeting, the researcher contacted directors by letter and telephone for permission to include selected programs in the research. Approval for the use of human subjects was obtained from the Behavioral Institutional Review Board at Wayne State University, and from the appropriate boards and/or administrators of the colleges included in the sample.

Next, data collection packets were constructed. Each packet included a cover letter, a background information form, and the test manuals and scoring sheets for the measures of critical thinking and learning style. All materials in the packets were imprinted in advance with code numbers, to ensure accurate collation. Data collection procedures were pilot tested with a small group of students, and a problem with one of the answer sheets was resolved.

The researcher traveled to the seven colleges to collect data during the spring and summer of 1998. Data collection was scheduled during or immediately following a

required first-year course, at each site. The entire class was invited to participate, but students had the option to decline involvement after the study was described to them. Those who preferred to decline were asked to complete the parts of the background information form with which they were comfortable, and then remain in their seats to read or study quietly.

Instruments.

Data collection instruments included:

1. **Background information form:** Students were asked to report essential data (see sample form in the Appendix).
2. **The Watson-Glaser Critical Thinking Appraisal, Form S (Watson & Glaser, 1994):** The WGCTA is one of four commercially available standardized measures of critical thinking appropriate for use with adults. It has been used in research since 1937, but was revised in 1964 and again in 1980 for current word usage and elimination of racial and gender stereotypes. In the short form of the instrument (which can be administered in 30 minutes) the student reads neutral and controversial scenarios related to everyday life, and responds to 40 multiple-choice items. The items are distributed among five subtests (inference, recognition of assumptions, deduction, interpretation, evaluation of arguments). Answer sheets can be hand or machine scored. Total raw scores of 0 to 40 are used to rank subjects or evaluate them in comparison to normative data (subtest scores are not intended to be used alone, because internal consistency among them is low). The WGCTA is the only test of critical thinking which includes normative data for health professionals (nurses).

Construct validity has been demonstrated by moderate to high correlations

between the WGCTA and several other tests of mental ability, logical thinking, and scholastic aptitude. Factor analysis of the WGCTA with measures of general intelligence indicate that the construct of critical thinking is related to but does not overlap with intelligence. Criterion-related validity coefficients of .24 to .50 have been reported when the WGCTA is used as a predictor of academic success in nursing and teacher-education programs: According to Cronbach's rule of thumb (1990), predicting with validity in this range can make an appreciable practical contribution. The reliability of this measure is also good. The coefficient for internal consistency (Cronbach's alpha) for the development sample of 1,608 persons was .81, and test-retest reliability with a smaller sample of employees in a publishing company was .81 ($p < .001$).

3. Learning Style Inventory (Kolb, 1985): Kolb's LSI was developed specifically for applications in adult and professional education. Originally published in 1976 and revised in 1985, the LSI is one of the older and more thoroughly investigated measures of learning style (Knowles, Holton & Swanson, 1997). It has been used more frequently than any other instrument in studies of the learning styles of occupational therapy students.

The current instrument is a 12-item questionnaire, which learners administer, score and interpret for themselves. Each item asks the respondent to rank-order four possible endings for a sentence stem which is a variation of "I learn best by . . ." The endings correspond to four learning modes: Concrete Experience (feeling), Abstract Conceptualization (thinking), Active Experimentation (doing), or Reflective Observation (watching). Respondents tally the numbers in the four columns to obtain scores from 12 to 48 for each learning mode. Then they calculate two combination scores ranging from

+ 36 to - 36, through subtraction. The combination scores are intended to categorize individuals along the bipolar dimension of active versus reflective learning (doing score minus watching score) and along the bipolar dimension of concrete versus abstract learning (feeling score minus thinking score). Combination scores are plotted on a profile to identify the respondent's learning style type (accomodator, assimilator, converger, diverger). Norms for gender, age and educational level are provided, based on the test development sample of 1, 446 adults.

Kolb states that the self-report format of the LSI is appropriate because the purpose of the inventory is to encourage self-examination and self-development in the individual adult learner (Kolb, 1981; Smith & Kolb, 1996). However, self-description instruments like the LSI are susceptible to limitations which can affect reliability and validity, when they are used in measurement of between-individual differences (Anastasi, 1988; Cronbach, 1990). One such limitation is the potential for distortion in scores resulting from interpretations made by the respondent. For example, the LSI asks respondents to recall "recent situations in which you had to learn something new" when choosing sentence endings to describe themselves (Kolb, 1985, p. 2): A student completing the LSI after a neuroanatomy test might respond differently than a student who recalls an experience at work or a tennis lesson. The terms used in the short sentence endings provided for LSI items are also vulnerable to definition or qualification by the respondent (i.e., I am an intuitive person, I am careful). A second problem related to the self-report format is susceptibility to response sets, such as faking, social desirability and sacrificing accuracy for speed. As Cronbach has noted, "The self-report is a 'published' self-concept - a deliberate self-presentation - not a factual description"

(1990, p. 513). Subjects in the study of weekend occupational therapy students might be motivated to create a favorable impression by purposely or unintentionally assigning higher ranks to LSI responses which seem more acceptable (for example, indicating that they rely on careful thinking rather than on hunches and feelings). Alternately, subjects might be predisposed to assign the same rank to all sentence endings in a particular column of the LSI, rather than taking the time to read and weigh responses to each sentence stem.

Kolb reports several steps taken during the development and revision of the LSI, to control for the limitations of self-response instruments. These include simplifying the language and instructions, using a forced-choice format, using positive wording for all sentence endings, emphasizing in the instructions that all styles of learning have strengths, keeping the instrument short (Kolb, 1981; Smith & Kolb, 1996). Controls for the response sets of social desirability and sacrificing speed for accuracy, were also built into the data collection procedures for the study of weekend occupational therapy students. These included openness (encouraging candor by clarifying the purpose of the study and ensuring anonymity), and providing lunch (so that students would be less inclined to rush).

Internal reliability for the four basic scales and two combination scores of the LSI is reported to be good, as measured by Cronbach's alpha (coefficients for a sample of 268 range from .73 to .88). However, studies using the LSI have reported moderate to low test-retest reliability (Sims, Veres, Watson & Buckner, 1986; Stumpf & Freedman, 1981). Kolb notes that high stability cannot be expected in measures of learning style, because style is not a fixed trait, but a preference "which will vary from time to time and situation

to situation" (1981, p. 290).

Kolb (1984) states that evidence for the construct validity of the inventory is provided by intercorrelations among the scale scores which are congruent with experiential learning theory (for example, he found strong negative relationships between the thinking and feeling scores and between the doing and watching scores of individuals in the test development sample). The relationships he found between LSI scores and career choice in the sample also support the validity of the measure: People in human service occupations such as social work and nursing tended to be active or concrete learners, while people in technical occupations such as engineering and computer science tended to have abstract or reflective styles (Kolb, 1984). In the 1980s, however, other researchers questioned the validity of the LSI, because they failed to find relationships between the learning style type of business administration students and variables such as work experience, job position or area of study (Marshall & Merritt, 1985; Stumpf & Freedman, 1981). More recently, Cornwell and Manfredo (1994) concluded that researchers should use the LSI learning mode scores (which are based directly on the rank ordering of sentence endings given by subjects), instead of the combination scores or style types (which are based on subtracting pairs of ipsative scores, so have no absolute values) for valid comparison of individuals or groups. Their study of 292 college students and management professionals demonstrated that the LSI modes are associated with differences in the ability to learn or master a new skill (for example, doers learned an origami paper-folding task more quickly and accurately than subjects who preferred other learning modes, while thinkers performed better than the other groups on a test of mental ability).

Threats to validity.

According to Stanley and Campbell (1963), the major threats to internal validity in nonexperimental research are selection bias (differences in groups which could have come about through differential recruitment of members) and mortality (differences due to the differential dropout of persons in the groups). Selection bias was not a factor in this study, because all members of the accessible population were recruited. Procedures to prevent mortality were built into the methodology of the study, and participation rate was high. The background information provided by those few students who failed to complete one of the measures or were excluded from the data analysis for other reasons was compared with the information provided by participating subjects, and the results of the comparison was reported.

The primary threat to external validity for the regression design was interaction of selection with the explanatory variables. The issue of whether the weekend programs selected for the study were representative of the weekend programs to which the findings were generalized, was addressed by including all seven programs which comprised the accessible population.

Data Analysis

Nominal data from the background information form were assigned dummy codes (e.g.; 1 = COTA, 0 = not COTA). WGCTA raw scores (interval scaled) were obtained by scanning the answer sheets using a key provided with the instrument. Students' calculations in the LSI self-scoring booklets were checked for accuracy, and (interval scaled) scores obtained for each of the four learning modes and for the two combinations. Learning style types were plotted on the profile provided, and the four types were

assigned codes. A code matrix was constructed, and data was entered into a computer file, using the Data Editor function in SPSS 7.5 (Norusis, 1997).

Data analysis was completed in several phases. First, characteristics of the sample of students were described in terms of frequency distributions and measures of central tendency and dispersion, using the Frequencies function in SPSS 7.5. Then, critical thinking and learning style scores were summarized and compared to norms available in the technical manuals of the measures. Next, bivariate relationships among the variables for the study were calculated and examined for significance and congruence with theory and previous research. Pearson product-moment correlation coefficients were produced for interval variables, using the Correlate function in SPSS 7.5. Independent samples t-tests were calculated when one of the variables in a combination was dichotomous, using the Compare Means function. Scatterplot matrices were produced with the Graphs function, to determine whether the relationships between interval independent variables and the dependent variables were linear. Then, multiple regression analysis (Linear Regression program in SPSS) was used to build an explanatory model for critical thinking and a separate model for learning style. Keppel and Zedeck (1989) state that multiple regression analysis is almost always more powerful than analysis of variance in analyzing nonexperimental research, and that it is the appropriate choice when group sizes are unequal.

In the multiple regression analyses, significant control variables were entered first in a group, followed by admission variables (also entered in a group). At each step of the procedure, the statistical hypothesis $H_0: \rho = 0$ was tested. Significance levels for the bivariate tests and for change in R^2 was set at $p \leq .05$, because findings about

relationships between nursing students' backgrounds and their critical thinking skills and learning styles have been significant at this level. Variables which yielded an increment which was not significant were eliminated from the explanatory models.

Finally, diagnostic procedures (in addition to the scatterplots produced earlier) to test for violations of the assumptions for appropriate use of multiple regression analysis were completed, using the Linear Regression program in SPSS 7.5. The assumptions for appropriate use of multiple regression analysis are: 1) the data comes from a random sample (randomness was not essential for this study, because data from the entire accessible population was included); 2) relationships between the X and Y variables are linear; 3) for each combination of values of the X variables, the distribution of the Y variable is normal with a constant variance (Norusis, 1997). Histograms of standardized residuals from the regression equations were examined for violations of the assumption of normality. Studentized residuals were plotted against predicted values for the dependent variables, to check for constant variance.

Chapter 4

Results

Description of the Sample

A total of 177 first-year students (77% of the first-year students enrolled in the seven weekend occupational therapy programs selected) participated in the study. Table 1 shows frequencies and percentages of students included in the sample from each site.

Table 1

Number and Percent of Subjects From Seven Sites

Program	Participants	Percent of First-Year Class
1	33	92%
2	38	84%
3	12	100%
4	12	36%
5	15	94%
6	36	100%
7	31	57%

A scheduling conflict resulted in the low participation rate (36%) at one site. The mean age of the weekend students who participated in the study was 31; their age range was from 20 to 58 years. As is typical in occupational therapy programs, far more of the students were women (85%) than men. Most participants in the study were native

English speakers, but 19 students (11% of the sample) reported learning to speak another language first. Their native languages included Spanish, Russian, Polish, and various dialects from India, the Caribbean and the Pacific islands.

There was greater diversity among the students enrolled in programs located on the east coast of the U.S. (near New York City or Miami), than among those attending programs in the north central or midwestern regions. All but one of the students for whom English was a second language were enrolled in the east coast programs. These programs reported that many of their students commuted from several states (Barry University, 1996; Hettinger, 1995). In addition, more of the men included in the sample were enrolled in the east coast programs.

The sample was nearly equally divided between Certified Occupational Therapy Assistants (COTAs, $n = 83$) and students with other occupational backgrounds ($n = 90$). The COTAs had a mean of 4.5 years work experience in occupational therapy. Twenty-six of the students who were not COTAs (15% of the sample) had earned certification in other disciplines related to health and human services (e.g., physical therapy assisting, special education). The remaining participants reported a wide variety of previous occupations, including homemaker, clerical worker, salesperson and teaching/nursing/rehabilitation aide.

Because most of the programs admitted only COTAs to their undergraduate tracks, and only persons with baccalaureate degrees in other disciplines to their master's entry-level tracks, there was a strong association between occupation and degree in the study sample ($\phi = .76, p < .05$). Approximately half of the students ($n = 86$) held associate degrees, and half ($n = 85$) held baccalaureate degrees. Five students had earned

master's degrees in other fields prior to admission to a weekend occupational therapy program. With the exception of their occupations, there were no significant differences between the undergraduate students (most of whom were COTAs) and the graduate students, in terms of the attribute variables for the study.

The students reported a mean cumulative college GPA of 3.37 at admission to the professional programs. Because five of the programs included a course in physics as a prerequisite to the occupational therapy major, 113 students reported grades in physics. Mean grade was 3.33; 51 students had earned grades of A or A - and 11 students received grades of C or D.

Critical Thinking

The dependent variable for analysis of the data related to critical thinking was raw score (from 0 to 40) on the Watson-Glaser Critical Thinking Appraisal, Form S (WGCTA). The independent variables of primary interest were three factors that weekend programs consider when selecting students for admission and assigning them to groups or tracks within the curriculum (cumulative college GPA, degrees earned and occupation). The control variables were three student attributes which have been found to be related to critical thinking in past research (age, native language and years of work experience). A fourth control variable (grade in prerequisite physics course) was included because some studies have shown it to be a better predictor than cumulative GPA of academic success in health professions programs.

A total of 155 students submitted usable WGCTA forms. Of the 22 cases in the sample missing critical thinking scores, 15 were COTAs from one large program, who could not complete the measure because of a change in their class schedule. Sixteen

additional cases were excluded from the data analysis, so that two variables which were highly related (degrees earned and occupation) could be combined into one factor (career preparation). Nine of the subjects excluded were COTAs who had also earned baccalaureate degrees in other fields. The remaining seven subjects were students admitted with associate degrees, who were not COTAs.

Demographics and academic achievement were compared for the cases missing data or excluded from the analysis, and the sample as a whole. The two groups were comparable in gender (77% of the nonparticipants were women, compared to 85% of the sample), age (mean age for the missing or excluded cases was 33, compared to 31 for the sample), GPA (mean was 3.17 for the nonparticipants and 3.37 for the sample), and grade in physics (mean grade for nonparticipants was 3.10 compared to 3.33 for the sample). However, students for whom English was a second language were over-represented among the missing and excluded cases (23% of the group, compared with 11% of the sample).

WGCTA scores for weekend occupational therapy students were distributed approximately normally from 14 to 37 (skewness = $-.19$, SE = $.20$; kurtosis = $-.89$, SE = $.40$). Table 2 shows mean scores for the sample as a whole, for COTAs with associate degrees, and for weekend students with bachelor's or master's degrees in other fields. Normative data based on a sample of 111 successful health professionals (managers and educators in nursing), are also provided.

Table 2

Critical Thinking Scores for Weekend Occupational Therapy Students and Norm Group

<u>Weekend Students</u>		<u>COTAs/Associate</u>		<u>Others/Graduate</u>		<u>Nurse Managers</u>	
Mean	SD	Mean	SD	Mean	SD	Mean	SD
27.44	5.66	25.18	5.41	29.35	5.19	30.52	4.86

As the table indicates, students who entered occupational therapy programs at the second baccalaureate or graduate level were stronger critical thinkers than those who entered with associate degrees. This difference was significant; $t(139) = 4.66, p < .05$. Significant positive relationships were also found between critical thinking scores and cumulative college GPA ($r = .25, p < .05$) and between critical thinking scores and grade in physics course ($r = .27, p < .05$). None of the attribute variables (age, native language, years of work experience) were significantly associated with critical thinking skills.

A scatterplot matrix showed that the relationships between critical thinking and the interval independent variables (GPA and grade in physics) were linear.

A multiple regression analysis was conducted, to determine whether a combination of the factors significantly associated with critical thinking explained more of the variability in scores than any one factor alone. The control variable (grade in physics) was entered first, and the admission variables (career preparation and college cumulative GPA) were entered together next. The results of the multiple regression analysis are shown in Tables 3 and 4, below.

Table 3

Summary of Multiple Regression Analysis for Critical Thinking

Variables	R Square	Adj R Square	SE	F	Sig
Step 1: Control Variable					
Grade in Physics	.08	.07	5.20	8.00	.006
Step 2: Admission Variables					
Career Prep, GPA	.15	.13	5.04	5.60	.001

Table 4

Beta Coefficients and Collinearity Statistics for MRA for Critical Thinking

Variables	Beta	t	Sig	Tolerance
Step 1: Grade in Physics	.28	2.82	.006	1.00
Step 2: Grade in Physics	.19	1.94	.055	.91
Career Preparation	.25	2.54	.013	.95
Admission GPA	.14	1.44	.152	.96

Together, the independent variables explained 13% of the variance in the critical thinking scores of weekend occupational therapy students. Cumulative college GPA did not contribute significantly to the equation after grade in physics had been considered.

Analysis of the residuals of the equation confirmed that the assumptions of normality and constant variance, required for the use of multiple regression, were met. A histogram of the standardized residuals showed an approximately normal distribution. No pattern was observed in a scatterplot of Studentized residuals against predicted values for critical thinking scores.

Learning Style

Three students failed to complete the Learning Style Inventory, or scored it improperly. Mean scores on the learning mode scales and bipolar dimensions for the remaining 153 subjects are presented in Table 5, along with interpretive data based on the inventory's normative sample (1,146 adults with a variety of occupations and an average of two years post-secondary education).

Table 5

Comparison of LSI Scores for Weekend Students with Scores for Normative Sample

LSI Scale	<u>Weekend Students</u>		<u>Normative Sample</u>	
	Mean	SD	Percentile Range	Mean
<u>Learning Modes</u>				
Concrete Experience	24.90	7.2	40 - 50	26.00
Reflective Observation	30.78	7.2	50 - 60	29.94
Abstract Conceptualization	29.99	7.0	40 - 50	30.28
Active Experimentation	34.18	7.2	40 - 50	35.37
<u>Combination Scores</u>				
Abstract minus Concrete	5.10	11.6	50 - 60	4.28
Active minus Reflective	3.38	11.7	40 - 50	5.92

The scores indicated that weekend occupational therapy students used the Reflective Observation (watching) mode of learning more than did members of the standardization sample.

The tendency of weekend students to be more abstract and less active than the norm group in new learning situations, was also apparent in their combination scores.

Learning style types for individual students were calculated by plotting the combination scores (Abstract - Concrete and Active - Reflective) on the normative profile provided in the instrument's administration manual. Findings for weekend students are

summarized in Table 6.

Table 6

Frequency of Four Learning Style Types Among Weekend Students

Learning Style Type	Frequency	Percent of Weekend Students
Assimilator	52	34%
Converger	34	22%
Accommodator	34	22%
Diverger	33	22%

Although all four learning style types were represented in the sample, assimilator was the style most frequently preferred by weekend occupational therapy students.

The ratio of assimilators to students with other styles of learning varied among the sites. The assimilator style was preferred by 42% of the weekend students enrolled in the four colleges located on the east coast ($n = 96$). This type described only 21% of the learners enrolled in programs located in the north central or midwestern regions of the U.S. ($n = 57$).

A group profile for the sample was also developed, by plotting mean scale scores on the normative grid. As a group, weekend occupational therapy students fell into the assimilator quadrant of the grid.

Since previous research has found LSI learning mode to be a more valid measure than style type of individual differences in approaching learning, and Reflective

Observation (RO) was the learning mode which differentiated weekend occupational therapy students from other groups, it was used as the dependent variable for the remainder of the data analysis. Reflective Observation scores were distributed approximately normally in the sample, from 13 to 48 (skewness = .14, SE = .20; kurtosis = - .21, SE = .39).

Cumulative college GPA at admission and grade in prerequisite physics course were significantly negatively associated with Reflective Observation ($r = - .18, p < .05$; $r = - .28, p < .05$). No significant relationships were found between Reflective Observation and students' attributes or career preparation. Location of college was included in the data analysis as a control variable, because it was significantly related to learning mode; $t(151) = 2.68, p < .05$.

A scatterplot matrix of the interval independent variables (GPA and grade in physics) with Reflective Observation scores showed that the relationships were linear.

Multiple regression analysis was conducted, to determine whether a combination of the factors significantly related to Reflective Observation could explain more of the variability in these scores than any one factor alone. The control variables (grade in physics and location of the college) were entered first as a group, and the admission variable (cumulative college GPA) entered next. The summary for the learning style equation is shown in Table 7. Standardized beta coefficients and collinearity statistics for the equation appear in Table 8.

Table 7

Summary of Multiple Regression Analysis for Reflective Observation Learning Mode

Variables	R Square	Adj R Square	SE	F	Sig
Step 1: Control Variables					
Physics, Location	.11	.09	6.79	5.99	.004
Step 2: Admission Variable					
Cumulative GPA	.11	.09	6.81	4.08	.009

Table 8

Beta Coefficients and Collinearity Statistics for Learning Mode Equation

Variables	Beta	t	Sig	Tolerance
Step 1: Grade in Physics				
Location of College	.19	1.87	.065	.91
Step 2: Grade in Physics				
Location of College	.19	1.86	.066	.91
Cumulative GPA	-.06	-.58	.563	.93

The combination of grades and location of college explained 9% of the variability in the learning mode preference of weekend occupational therapy students. Cumulative

college GPA did not contribute to the equation after grade in physics had been considered.

Diagnostic procedures confirmed that the assumptions of normality and constant variance, for appropriate use of multiple regression analysis, were met. A histogram of the standardized residuals from the regression showed an approximately normal distribution. No pattern was observed in a scatterplot of Studentized residuals against predicted values for Reflective Observation.

Chapter 5

Conclusions and Recommendations

Critical Thinking

The results of this investigation were consistent with those of several studies in nursing, which showed that “critical thinking increases with higher education” (Beck, Bennett, McLeod & Molyneaux, 1992, p. 25). Students who entered professional-level weekend occupational therapy programs after completing bachelor’s or master’s degrees in other fields were significantly stronger critical thinkers than students who entered with associate degrees in occupational therapy assisting.

Since only first-year students were included in the sample, the hypothesis that those with associate degrees will “catch up” with their classmates as they gain experience in higher education could be tested through longitudinal research. Miller’s study of critical thinking among nursing students with technical school versus college degrees demonstrated just such an effect (1992). Additional research is also recommended to determine whether a course or instructional unit in logical thinking would improve the critical thinking skills of students admitted to weekend programs at the associate degree level. If such a course or unit helped significantly, it could be added to the program requirements for these students.

The argument that individuals with advanced degrees are better critical thinkers is a keystone in the recent decision by the Commission on Education of the American Occupational Therapy Association to recommend post-baccalaureate education for entry to the profession (PBE Level, 1998). The argument has lacked empirical support, since research on the critical thinking skills of occupational therapy students at various

educational levels has not been reported. This study of weekend students, however, does support the Commission's argument. A second key assumption in the Commission's decision was not explored in this study, and should be the focus of future research. The group states that the ability of the graduate with postbaccalaureate education to engage in higher-level critical thinking is "an essential factor in assuming more complex OT roles" (PBE Level, 1998, p. 14). They refer to such roles as research, consulting, management, policy-making, entrepreneurship. Currently, there is no evidence of a relationship between critical thinking and assuming or performing any role in occupational therapy. It could be hypothesized that cognitive abilities which are not developed through formal education (for example, divergent thinking, knowing-in-action, post-formal thought) predict more accurately than critical thinking skills which graduates will become leaders. This hypothesis could be tested in a longitudinal study of graduates who were administered a battery of cognitive measures early in the occupational therapy program.

The finding of this investigation that stronger critical thinkers earned higher grades was also consistent with previous research; the relationship of logical thinking and academic achievement is well known. Grade in physics was more useful in explaining variability in critical thinking scores than was cumulative college GPA. As researchers in physical therapy have suggested, grades in science courses may be more directly related to academic achievement in health sciences programs, than the preprofessional GPA which is calculated from disparate sources (Hayes, Fiebert, Carroll, & Magill, 1997; Templeton, Burcham & Franck, 1994). It is recommended that those weekend programs which do not include physics as a foundation course for the occupational therapy major consider adding one. An important function of the course could be to identify students

who need additional help with scientific thinking, early in the process of professional education.

Perhaps most importantly, the results of this investigation showed that the combination of educational level and grades, factors emphasized when students are selected and grouped in weekend occupational therapy programs, explained only 13% of the variability in the students' critical thinking scores. Clearly, educators need to know more about variables that predict and affect higher-order thinking in the rapidly growing population of nontraditional students.

Learning Style

All four of Kolb's learning style types were represented among the weekend occupational therapy students who participated in this study. However, these nontraditional students as a group preferred a different mode of learning and learning style type than the traditional students studied in the 1980s. Weekend students preferred to learn through reflective observation (watching), while traditional students preferred to learn through concrete experience (doing) (Cahill & Madigan, 1984; Katz, 1988; Katz & Heimann, 1991; Stafford, 1986). Weekend students fell into the assimilator style type, in contrast to the traditional students in all of the older studies, who were accommodators. Kolb states that assimilator and accommodator are opposite styles of learning (Smith & Kolb, 1996). Assimilators learn by observing others and analyzing information from a variety of perspectives; they tend to be cautious and take extra time before acting. Accommodators are "hands-on" learners; they like to deal directly with practical problems, and rely on intuition and trial-and-error more than on systematic thinking.

The apparent differences between today's weekend students and the traditional

students of 15 years ago could simply be the result of limitations in research design and instrumentation. Nonrandom samples were used in all of the older studies. Self-report instruments like the LSI are vulnerable to response sets such as social desirability: Perhaps traditional students reported that they preferred learning by doing because they had been told that occupational therapy was a hands-on profession, or perhaps weekend students' responses were distorted (in spite of controls built into the methodology) because they were aware of the emphasis currently placed on reflective thinking in occupational therapy. Finally, critics have advised that researchers use caution when comparing groups based on LSI style types, since the types are identified by subtracting ipsative scale scores which have no absolute values.

Because the results of previous and current research on learning styles have been so consistent across schools, however, it is reasonable to conclude tentatively that weekend students are different than students who have traditionally enrolled in occupational therapy programs. One possible explanation for the difference is related to diversity. Weekend programs recruit students for whom occupational therapy is a second career or a significant change in a previously established career pattern, and the students enrolled in east coast programs come from particularly diverse backgrounds. The interdisciplinary studies cited in Chapter 2 provide evidence that systematic differences in learning style can be expected among people who have had different educational and occupational experiences. This explanation is also congruent with career development theory. Holland (1973) and Super (1981) are among those who have proposed that each occupation requires a characteristic pattern of abilities, interests, values and personality traits, and that individuals seek occupations which are congruent with their personalities.

According to Super, initial career choices are adjusted as the individual matures and gains experience, and his or her self-concept changes. Research using measures based on Super's theory with large national and international samples, has demonstrated that students enrolled in various college majors do differ systematically from each other in personal characteristics such as values and interests (Fitzsimmons, G.W, Macnab, D. & Casserly, C., 1984). Specifically, significant differences have been found between individuals studying or practicing occupational therapy and individuals in other professions. For example, Madill, et al. (1986) used the Life Roles Inventory to compare the values of 1366 female occupational therapists and 1000 women in other professional positions in Canada. They found that social interaction and creativity were more strongly endorsed by occupational therapists, while advancement, economics, risk and achievement were more important to women in other professions. Madill, Macnab and Brintnell (1989) compared occupational therapy students with physical therapy and speech pathology students at two Canadian universities, and concluded that occupational therapy students placed greater emphasis on creativity and variety. More recently, Esdaile, Lokan and Madill's (1997) study of Australian occupational therapy students provided evidence that individuals who initially chose another career are different than those who chose occupational therapy first. The study demonstrated that students who accepted a place in an occupational therapy program in spite of their preference for physical therapy valued advancement, economic factors, prestige and variety significantly more than did their peers for whom occupational therapy was a first choice. Finally, a study of students in four American programs (Madigan, 1985) found that persons who chose to study occupational therapy at the technical level had different values, goals and

roles than those who chose professional level education (professional students valued variety, intellectual stimulation and independence more than did technical students).

An alternate hypothesis for the preference of subjects in this study for learning by watching, is that working adult students approach professional education cautiously because they are readjusting to the student role. Knowles has stated that adults have "a deep psychological need to be seen by others and treated by others as capable", and that returning to the role of learner affects their self-concept (1998, p.65). Malarkey noted that the older nursing student "often initially expresses fear of failure and some strong feelings of anxiety about her ability to learn" (1979, p. 16). Babola and Graham concluded based on their survey of 196 nontraditional occupational therapy and physical therapy students in Texas, that these individuals experience stresses including conflicting schedules, fatigue, lack of leisure and social activity, and difficulty relating to professors of their own age (Kerr, 1998). Because the adult learners in weekend occupational therapy programs have made significant personal and financial sacrifices to continue their education, they may be more reluctant than traditional students to risk mistakes or failure. Relationships between a preference for the reflective observation mode of learning and indicators of low self-esteem or stress should be investigated in future studies; a regression design could be used to examine a combination of variables. Qualitative research is also recommended, to explore in depth students' perceptions about learning in a weekend college environment.

Together, grades (cumulative GPA at admission and grade in physics) and location of the college explained only 9% of the variance in the learning style scores of weekend students. The other variables that were expected on the basis of literature

review to be related to learning style (gender, age, occupation, years of work experience), did not contribute significantly to the regression equation. Although the study did not provide an explanation of the relationships among students' characteristics and their learning styles, the findings do have practical implications for effective teaching and curriculum design.

Faculty in weekend programs can expect to have many reflective learners (watchers), along with students who prefer other styles of learning, in their classrooms. Kolb has suggested that "real education lies in helping learners grow in all four learning modes: in their favored ones to be comfortable and successful part of the time; and in their nonfavored ones, to stretch their other learning abilities" (Smith & Kolb, 1996, p. 18). McCarthy (1980) noted that traditional teaching methods allow only analytical learners (thinkers) to excel. She recommended that teachers vary their role and the nature of the experiences provided during an instructional unit, so that each mode of learning (feeling, watching, thinking and doing) is emphasized approximately 25% of the time. Smith and Kolb (1996) stated that instructors can best meet the unique needs of their reflective students by acting as task master and guide (Smith & Kolb, 1996). In this role, the teacher creates opportunities for structured observation, and helps students to form new concepts by analyzing the observed data from different viewpoints.

Schön (1987) described a curriculum model for professional programs, that emphasizes reflective learning. He recommended organizing the core curriculum of the program around a reflective practicum based on Dewey's belief that the student "has to see on his own behalf and in his own way the relations between means and methods employed and results achieved. Nobody else can see for him, and he can't see just by

being 'told', although the right kind of telling may guide his seeing and thus help him see what he needs to see" (1974, p. 151). The prototype of the reflective practicum is the architectural design studio. In practicum, students work in small groups to complete a manageable simulated or real project (for example, designing a school building). Faculty, who are also master practitioners, function as coaches. A coach may guide the students using traditional teaching methods at times: By "communicating information, advocating theories, describing examples of practice" (Schön, 1987, p.38). The primary roles of the coach, however, are demonstrating his or her own approaches to professional problems (thinking out loud, sketching), and engaging in dialogue with students (advising, questioning, criticizing), as they work toward solutions.

Schön's reflective practicum is different in important ways from most models of experiential learning implemented in occupational therapy education. For example, occupational therapy students are required to complete six months of Level II fieldwork as a culmination of the professional program, during which they gradually assume responsibility for a clinical caseload under the supervision of an experienced practitioner. Schön believed, however, that approaching professional knowledge as if it were hierarchical (beginning curricula with basic science courses and ending with practical application) contributes to a dangerous gap between theory and day-to-day problem-solving in the discipline (1987). Wittman (1990) is among the occupational therapy educators who have expressed concern about this disparity between educational preparation and the expectations of practice. Schön also noted that opportunities for observation, dialogue and reflection are limited in fieldwork situations, because "clinics are not set up for the demanding tasks of initiation and education. Pressures for

performance tend to be high; time, at a premium; and mistakes, costly. Senior professionals have learned, in addition, to expect apprentices to come equipped with rudimentary practice skills" (Schön, 1987, p.37).

Problem-based learning (PBL), an active learning model which originated in medical education, shares some characteristics with the reflective practicum. Problem-based learning has been incorporated into individual courses, and integrated with the core curriculum in occupational therapy programs (Royeen, 1995; VanLeit, 1995; Watson & West, 1996). In PBL, students work in small groups to solve clinical problems, which are typically presented in written form or on film. The role of the tutor in PBL, however, is very different than the role of the coach in a reflective practicum. Tutors must be skilled in facilitating group discussion, but they do not need to be experts in the subject matter. PBL is intended to facilitate self-directed learning, so tutors are cautioned to avoid "giving information to the students" or "expressing an opinion concerning the correctness or quality of any student's comments or contributions" (Barrows, 1988, p. 19). Because tutors do not demonstrate their own professional skills or reasoning processes, PBL offers little opportunity for learning by watching. Feelings of frustration related to ambiguity and lack of feedback are often reported among students in problem-based learning programs (Hammel, Royeen, Bagatell, Chandler, Jensen, Loveland & Stone, 1999).

An occupational therapy teaching method which appears more congruent with Schön's concept of the reflective practicum, is classroom as clinic (Neistadt, 1987; 1992). The classroom as clinic method is designed to help students develop clinical reasoning skills. Its effectiveness has been demonstrated with traditional students in first-year, second-year and senior-level core courses. The students are first asked to review written

information about a client, and develop an initial list of the client's problems and needs related to occupational therapy. Then the client is brought into the classroom as a guest. In small groups, the students meet and interview the client, or watch a skilled therapist conduct the interview. Finally, the students revise their initial impressions and compare their lists with those of the instructors (who are experienced practitioners). Classroom as clinic methodology may meet the unique needs of reflective learners, because it provides opportunities for observation and analysis of information from various perspectives.

Faculty-facilitated Level I fieldwork (Rydeen, Kautzmann, Cowan & Benzing, 1995) is another promising method for teaching reflective learners. Level I fieldwork, like Schön's reflective practicum, is intended to be "integral to the program's curriculum design and include experiences designed to enrich didactic coursework through directed observation and participation" (The American Occupational Therapy Association, 1998, p.20). The traditional model for Level I fieldwork, however, is part-time or short-term placement of individual students in local health-care facilities, where they are likely to experience the obstacles to reflective learning common in apprenticeships (disparity between educational preparation and practice, lack of time for watching and thinking). In the alternative model, an occupational therapy faculty member identifies a population of clients not currently receiving services, and designs a program for them. The instructor assigns a small group of students to plan and present activities for the clients, with his or her guidance and supervision. Faculty-facilitated fieldwork is typically initiated because there is a shortage of traditional Level I fieldwork sites available to the school (Rydeen, et al, 1995). Faculty and students come to value it, however, because it allows students to observe clients and see their professors in the role of clinician, to generate ideas and

discuss them with others, and to practice emerging skills, in an environment relatively free of pressures, distractions and risks.

In conclusion, the purpose of this study was to investigate the thinking and learning skills of nontraditional students beginning their work toward professional-level degrees in occupational therapy. In spite of the fact that nearly one third of all occupational therapy students are over age 25 (P. Burchman, personal communication, July 7, 1997), and that the number of working adult students in occupational therapy programs will increase as the profession shifts toward post-baccalaureate entry level, very little data about this group has been available. Since the research sample included only students enrolled in weekend occupational therapy programs, however, the findings cannot be generalized to other nontraditional students. The results of the study confirm the anecdotal reports of some faculty and students that weekend students have unique learning needs. Students who enter weekend programs with associate degrees may need additional time in the university setting, or additional instruction, to equal their classmates in critical thinking skills. Since stronger critical thinkers earn higher grades in college, evaluation of interventions designed to improve critical thinking is essential. Additional research is also needed to determine whether critical thinking is related to professional achievement after graduation; this data would have implications for admission policies. Because a variety of learning styles were found among weekend students, faculty should use a variety of teaching methods in their courses. Opportunities for learning by observing and reflecting should be emphasized; innovative teaching methods including classroom-as-clinic and faculty facilitated Level I Fieldwork may be especially useful with nontraditional students. Experimental studies building upon Katz'

work (1990) should be designed to test the outcomes of matching these teaching methods with learning styles. Because enrolling in a weekend program demonstrates an unusual level of commitment to professional development, it is proposed that research directed toward understanding these students and helping them succeed should be viewed as a priority for occupational therapy education.

Appendix

WEEKEND OCCUPATIONAL THERAPY PROGRAMS

BACKGROUND INFORMATION

Please respond as carefully and completely as you can to the eight questions below:

1. Are you female?
 male?

2. How old are you? _____

3. What language did you first learn to speak?

English

other (Please write in) _____

4. What is the most advanced degree you have completed?

master's

baccalaureate

associate

5. Are you a COTA? yes no

If yes, how many years have you been employed as a COTA? _____

If no, what is your occupation? _____

How many years have you been employed in this occupation? _____

Are you certified in this or any occupation? (Please give credentials) _____

6. Have you had a college course in logic or critical thinking in the last four years?

___ no

___ yes (Please write name of course) _____

If yes, what was your grade in this course? _____

7. Have you had a college course in physics in the last four years?

___ no

___ yes

If yes, what was your grade in this course? _____

8. What was your cumulative college GPA at the time you applied to the occupational therapy program?

_____ (Please write in admission GPA)

Thank you for participating in this research!

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Abstract

**CRITICAL THINKING SKILLS AND LEARNING STYLES OF FIRST-YEAR
STUDENTS IN WEEKEND OCCUPATIONAL THERAPY PROGRAMS**

by

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Advisor: Dr. Shlomo Sawilowsky

Major: Evaluation and Research (Education)

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Eight college curricula in which all course work for a degree in occupational therapy is scheduled on weekends, have been accredited since 1984. Weekend occupational therapy programs recruit working adult students from diverse backgrounds. The purpose of this study was to determine the degree to which variability in the critical thinking skills and learning styles of first-year students in these programs could be explained by the students' previous education and experience.

A regression design was used. Three factors considered when students are selected for admission to weekend programs were treated as primary independent variables (degrees earned, cumulative college grade point average, occupation). Control variables included four student characteristics which previous research has indicated are related to critical thinking and/or learning style (gender age, native language, work experience). Grade in a prerequisite physics course was also treated as a control variable, because some studies have shown it to be a better predictor of academic success in health-

occupational therapy programs. The researcher administered the measures at each site in the spring/summer semester of 1998.

A background information form provided data about the independent variables. The Watson-Glaser Critical Thinking Appraisal (Form S) was used as the measure of critical thinking skills. Learning style was measured with Kolb's Learning Style Inventory. The SPSS 7.5 computer software was used for description and multivariate analysis of the data.

Students who entered weekend programs with bachelor's or master's degrees had significantly higher critical thinking scores than students who entered with associate's degrees. Educational preparation and grades together explained 13% of the variability in the critical thinking scores of the subjects. Weekend occupational therapy students, unlike the traditional students studied previously, preferred to learn by observing and reflecting. Grades and location of the college together explained 9% of the variability in their learning style scores. Implications for curriculum development and teaching methodology were discussed.

**Autobiographical Statement
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Education

1980	M.A. in Education	University of Michigan
1973	B.S. in Occupational Therapy	Eastern Michigan University

Academic Experience

1995-Present	Associate Professor	Barry University
1987-95	Assistant Director/ Education Coordinator	Occupational Therapy Department, Rehabilitation Institute of Michigan
1980-86	Assistant Professor	Eastern Michigan University

Recent Publications

1995 Effects of afternoon rest on the performance of geriatric patients in a rehabilitation hospital. American Journal of Occupational Therapy, September.

1995 Reasoning and the art of therapy for spinal-cord injury. American Journal of Occupational Therapy, April.

1993 Graded activity: Legacy of the sanatorium. American Journal of Occupational Therapy, August.

1993 Substance abuse and rehabilitation: An occupational therapy perspective. Rehab Management, April-May.

1992 The origin and evolution of activity analysis. American Journal of Occupational Therapy, January.

Recent Funded Research

1995	Forced Use and Function in Severe Chronic Hemiparesis	AOTF
1993	Effects of Activity/Rest Schedule on Performance	Del Harder
1993	Clinical Reasoning in Treatment for Coordination	AOTF
1991	Home Safety for Detroit Area Frail Elderly	Metro Health

Professional Activities and Honors

1998-99 Editorial Board, Innovations in Occupational Therapy Education

1998 American Occupational Therapy Association Service Award

1995-98 Roster of Accreditation Evaluators, American Occupational Therapy Association

1997 Barry University Professional Activity Award

1988-93 Field Correspondent, American Occupational Therapy Association's OT Week

1985-87 Founder and Chair, American Occupational Therapy Association Work Programs Special Interest Section