

Testing a Predictive Model of What Makes a Critical Thinker

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The goal of nursing education is to help individuals become self-determining, independent thinkers. Cognitive development may be the outcome that best characterizes such a thinker. The purpose of this study was to test a model of cognitive development in which four independent variables—knowledge base, critical thinking skills, critical thinking dispositions, and experience—were used to predict cognitive development. Data were analyzed from 232 practicing registered nurses. Three hierarchical levels of cognitive development were examined: dualism, relativism, and commitment. Critical thinking skill was a significant contributor only to the dualistic level of cognitive development. Critical thinking dispositions contributed to all three levels of cognitive development. Experience contributed only to the commitment level. The results of this study suggest that the development of a critical thinker may require time and experience. These findings can be used to examine current policy regarding the criteria used to evaluate nursing education.

Practicing nurses need to be autonomous professionals who use critical thought and judgment to support decision making and reasoned action in clinical practice. Therefore, an important goal of nursing education is to develop nurses who use critical thought in practice. In 1989, the National League for Nursing (NLN) began to require that schools of nursing quantify their ability to produce critical thinkers. Schools of nursing are still struggling to meet this requirement (Videbeck, 1997). The difficulty is that critical thinking is complicated to define and even harder to measure. Furthermore, the process of critical thinking differs from its outcome. A person may be able to think critically but rarely uses the ability in situations that call for

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careful thought and accurate judgment. The NLN mandate necessitates that these issues are clarified.

Critical thinking has been described as a unique kind of purposeful thinking about any subject, content, or problem in which the thinker improves the quality of the thought process by systematically and habitually reflecting on the criteria employed during the reasoning process (Ennis, 1991; Paul, 1993). Much of the earlier research in critical thinking has focused on the skills involved in the process, such as synthesis, analysis, and evaluation (Bauwens & Gerhard, 1987; Berger, 1984; Gross, Takazawa, & Rose, 1987). Theorists have recently stressed the importance of critical thinking dispositions, or the inclination to think through situations in a methodical and persistent manner, as an integral component of the critical thinking process (Oxman-Michelli, 1992; Siegel, 1988). Both skill and disposition appear to be necessary if one is to be a critical thinker.

Despite this apparent progress, a crucial third variable appears to have been ignored—cognitive development. Skill and the inclination to think critically are necessary but not sufficient to fully understand people who think, judge, decide, and act in a careful and conscientious manner. An advanced level of cognitive development is required to achieve this goal. Baccalaureate nursing students have been shown to enter their educational program with critical thinking skills and the dispositions to use them (Facione, 1997). The role of nursing education is to refine these skills, activate the dispositions to use critical thinking, and thus influence cognitive development. Education, however, may not be sufficient; experience may only continue the process of development. Critical thinking skills, dispositions, and cognitive development are formed during the educational process, but experience refines, strengthens, elevates, and synthesizes these components to produce the true critical thinker.

PURPOSE

The purpose of this study was to test this proposition using a predictive model of these variables in a sample of practicing nurses because they possessed the combination of education and experience. This study facilitates our understanding of how critical thinking skills and dispositions contribute to the development of the critical thinker.

The theoretical framework for this study was derived from Perry's (1970) theory of intellectual or cognitive development. Cognitive development is defined as a series of progressive changes in the way individuals think and

view the world when faced with experiences that conflict with their intellectual way of knowing (Sternberg & Berg, 1992). Individuals at relatively lower levels of cognitive development think in a state-dependent, systematic manner based on personal and social experiences, whereas those at relatively higher levels are able to think in an abstract and conceptual manner (Werner & Kaplan, 1963).

Perry postulates that individuals develop cognitively on a continuum from a basic position of dualistic thought through multiplicity and relativism to the highest level—commitment. Individuals who think dualistically see the world in polar or dichotomous terms (good vs. bad, right vs. wrong) and look to authority to give them one right answer. At the level of multiplicity, individuals acknowledge that different perspectives exist but believe that this diversity only is temporary until a correct answer is found. When the level of relativistic thinking is reached, people will recognize that alternative perspectives exist, but not each perspective is equally valid. They continue to believe that experts will eventually find the right answer. Commitment describes individuals who are dedicated to a personal viewpoint but recognize the diversities in other people's way of thinking. These persons realize that the values they now hold may be temporary and tentative; right answers are viewed from the context in which the situation or experience occurs.

Perry's theory of cognitive development includes the variables thought to be essential to critical thinking. Critical thinking skills and dispositions are introduced early in the cognitive development process. Critical thinking dispositions such as humility, open-mindedness, and inquisitiveness influence the ability to tolerate different perspectives (Oxman-Michelli, 1992; Paul, 1993). Critical thinking skills such as analysis, synthesis, and evaluation help individuals grapple with the realization that multiple perspectives exist. Life experiences obtained from exposure to the environment, education, and social factors influence critical thinking skills and dispositions. A strong critical thinker does not materialize until the commitment level of cognitive development is reached. Although we remain unclear as to exactly how this development occurs, we propose that cognitive development in nursing is influenced by critical thinking skills, the dispositions to pursue understanding and remain open to alternatives, and experience as a nurse.

RELATED RESEARCH

Our understanding of critical thinking has evolved rapidly during the past 20 years as a result of contributions from philosophy, cognitive psychology,

education, and nursing. However, a lack of consensus on a definition of the construct of critical thinking and the resulting division into philosophical camps has slowed progress in the field. The major differences in viewpoints appear to be how narrowly or broadly the boundaries of critical thinking are interpreted rather than the core issues. There is general agreement, however, that critical thinking skills and dispositions are integral components of critical thinking (Ennis, 1991; Paul, 1993; Siegel, 1988). To produce a critical thinker, most investigators support the need for both skills and dispositions (Ennis; Siegel). Dewey (1933) contends that the concept of critical thinking dispositions is the essential component. Data from an aggregate analysis of 145 samples from 50 nursing programs ($N = 7,926$) revealed a positive correlation between critical thinking skills and dispositions both at entry into a nursing program, $r = .201, p < .001$, and at exit, $r = .169, p < .001$ (Facione, 1997); however, the specific manner in which they are related remains unclear.

Three studies have examined the relationship between critical thinking skills and cognitive development in nursing (Brabeck, 1983; Gambino, 1995; McGovern, 1995); this relationship also remains unclear. Two of the three studies demonstrated a significant positive relationship between critical thinking skills and cognitive development (Brabeck; Gambino). Differences in results may be due to methodological issues. McGovern measured critical thinking skills using the California Critical Thinking Skills Test (Facione & Facione, 1994), whereas Brabeck and Gambino used the Watson-Glaser Critical Thinking Appraisal Test (1984). Cognitive development was measured in three distinct ways in the following three studies: (a) the Learning Environment Preference tool used by McGovern, (b) the Arlin Test of Formal Reasoning used by Gambino, and (c) the Reflective Judgment Interview used by Brabeck. One study was limited by significant subject attrition (McGovern).

Formal education may affect cognitive development (King & Strohm, 1985). One investigative team found that nursing students at higher levels in their educational process have better critical thinking skills and a more advanced level of cognitive development than those at lower levels of education (Mines, King, Hood, & Wood, 1990). Two studies, however, have shown that the upward trend in college students' cognitive development is slow and reaches only the multiplicity level of thinking by the end of their period of study (Frisch, 1987; McGovern, 1995). Cognitive development may not truly become manifest, regardless of when developed, until situations become increasingly complex or novel, such as those encountered with real world experiences (Adams & Zhou-McGovern, 1983). To date, there is

little research on cognitive development in nursing that has studied nurses in practice.

The research in this area is limited and narrow in its scope. Most research in nursing has focused on the critical thinking skills of students. Examination of critical thinking skills in relation to dispositions would be useful, but research is needed in which the critical thinking skills and dispositions are examined along with cognitive development. Because a certain level of experience may be necessary to complete the transformation into a critical thinker, practicing nurses should be included in this research.

METHOD

A correlational design was used to test a predictive model of knowledge base, critical thinking skills, critical thinking dispositions, experience, and cognitive development (see Figure 1). Prior investigators have studied critical thinking predominately in nursing students. Therefore, an additional variable, knowledge base, was added to the model to account for the influence of completing college education on cognitive development

Sample

A nonprobability sample of 290 registered nurses was drawn from the graduates of one Southern California baccalaureate nursing program. Participants were included if they had completed their entire basic nursing education at this institution; those nurses with a diploma or associate degree from other schools who were returning to school to attain a baccalaureate degree were excluded. Graduates were eligible to participate if they currently were working in nursing or pursuing postgraduate education. Subjects had to have worked at least 20 hours per week for a minimum of 2 years. Participants were required to be working in the same general practice setting (e.g., surgery, pediatrics) for at least 2 years. Those who had left the practice area were excluded, even if they had worked in a consistent place for 2 or more years, based on Benner's (1984) theory of nursing proficiency. According to Benner, when one begins work in a new area, the process of attaining competency begins again. The transition from novice to expert reflects a progression away from reliance on principles, concrete experiences, and pieces of a situation to becoming involved in the experience and seeing the "whole picture." This sampling criterion was used in an attempt to differentiate inadequate cognitive development from inexperience.

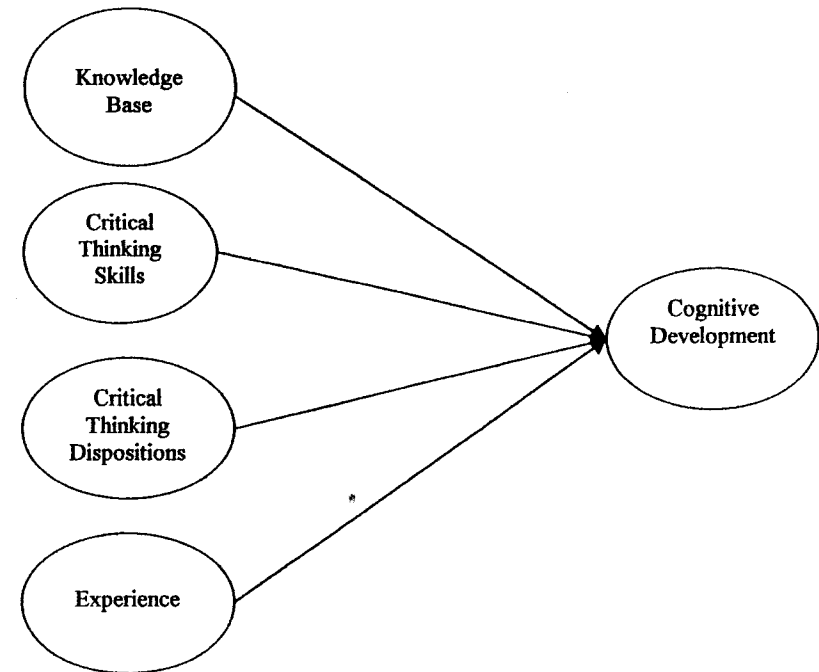


Figure 1. Hypothesized relationships among knowledge base, critical thinking skills, critical thinking dispositions, experience, and cognitive development.

Procedure

After obtaining institutional review board approval, a total of 721 letters describing the study were sent to individuals who had completed their baccalaureate nursing program between 1981 and 1995. A return postcard was included in the mailing, which allowed the graduate to indicate interest in participating as well as whether inclusion criteria were met. Eighty-five letters were returned as undeliverable, leaving an accessible population of 636 individuals. Of these, 270 (42.5%) were eligible and agreed to participate. A total of 111 individuals returned postcards stating that they did not qualify or were not interested in participating. Another 255 letters failed to elicit a response. Once agreement to participate in the study was received, each individual was mailed a packet that contained a consent form and a letter explaining the procedures for completing the packet material and questionnaires. A self-addressed, stamped envelope was included in the packet for

the return of the consent form and the measurement instruments (in a sealed nonidentifiable envelope). All subjects completed a demographic profile and three standardized questionnaires requiring approximately 2.5 hours to complete. Participants were told that they did not have to fill out all the instruments in one sitting but that they had to complete them in the order in the packet. In addition, participants were requested to allow only 45 minutes for the administration of the skills test, as instructed by the instrument authors. All responses were held confidential.

Measurement

Demographic variables were measured with an investigator-designed tool. Respondents were asked to provide information on postbaccalaureate education, certification, practice area, experience and role in nursing, and professional activities. Experience was measured in years working as a nurse in one practice area. The variables of critical thinking skills, dispositions, and cognitive development were measured using the standardized instruments described below. With the permission of the participants, knowledge base was measured using two scores obtained from college transcripts: overall grade point average minus the nursing academic grades (GPA-overall) and grade point average in the nursing program (GPA-nursing). These scores were entered simultaneously in the analysis to reflect knowledge base.

Critical thinking skills. Critical thinking skill was measured using the California Critical Thinking Skills Test (CCTST), a 34-item, multiple choice test designed to measure critical thinking in relation to short problem statements and scenarios (Facione & Facione, 1994). Each item was scored dichotomously, with one correct answer and three or four distracters. In psychometric testing by the instrument authors, the Kuder-Richardson-20 (KR-20) reliability was .70 in a sample of college students, and CCTST was significantly related to university grade point average (GPA), $r = .20$, $p < .05$, and SAT scores, $r = .44$ math, $.55$ verbal, $p < .05$. Construct validity was demonstrated in a study of 1,169 college students. Those who had completed an approved critical thinking course demonstrated significant growth in critical thinking skill, but those in the control groups did not. Five subscales (analysis, evaluation, inference, inductive reasoning, and deductive reasoning) and an overall critical thinking skills score are produced; only the overall score was used in this analysis. In this study, the KR-20 coefficient was .64.

Critical thinking dispositions. Critical thinking disposition was measured using the California Critical Thinking Disposition Inventory (CCTDI), the first and only available measure of dispositions (Facione, Facione, & Sanchez, 1994). The CCTDI assesses attitudes, opinions, and beliefs regarding critical thinking in a 75-item instrument. The test yields an overall critical thinking disposition score as well as scores for each of seven subscales (truth-seeking, open-mindedness, analyticity, systematicity, self-confidence, inquisitiveness, and maturity). Only the overall score was used in this analysis. The instrument authors demonstrated an alpha coefficient reliability of .91 for the overall instrument, with subscale scores ranging from .71 to .80. Construct validity was supported with significant correlations between individual subscales and established psychological measures. Overall scores ranged from 0 to 420; those scoring below 280 were considered weak in critical thinking disposition, whereas those scoring at or higher than 350 had a strong disposition towards critical thinking. In this study, the alpha coefficient reliability for the total scale was .80.

Cognitive development. Cognitive development was measured using the Scale of Intellectual Development IV (SID-IV), an objective measure of Perry's scheme of intellectual development (Erwin, 1986). Four dimensions of cognitive development are normally assessed by the SID-IV—dualism, relativism, commitment, and empathy. Empathy was not used in this analysis, as it was not consistent with the theoretical framework. The instrument author performed most of the reliability and validity testing on version II of the SID. Alpha coefficient reliability was .81 for dualism, .70 for relativism, and .76 for commitment. The four factors were correlated at a low level, which allowed individual cognitive development to be categorized in a single domain without threat of multicollinearity. No summary score was available because, according to Erwin (1981), subjects can function at all levels of cognitive development depending on the question. When the numbers obtained on the four scales were examined, the one highest score was considered the predominant cognitive level. Erwin reported construct validity of the SID-II in studies comparing high school and college GPA; there was a positive relationship between GPA and cognitive development, and students with a relatively higher GPA also demonstrated a relatively higher cognitive development score. Validity testing of SID-IV by the instrument author yielded similar results. Negative correlations were found between dualism and performance and decision making. The SID-IV is a 115-item instrument using a 4-point, Likert-type scale. The alpha coefficient reliability for the three factors in this study was .84 for dualism, .70 for relativism, and .72 for commitment.

Analysis

Hierarchical regression analysis was used to test a predictive model in which cognitive development was the criterion variable. Three separate hierarchical regression analyses were run on the SID-IV factors of dualism, relativism, and commitment to identify predictors of each level of cognitive development. Hierarchical regression analysis allows an examination of the incremental variance added at each step (Cohen & Cohen, 1983; Fox, 1991; Pedhazur, 1997). The change in r^2 and the associated test of significance were used to assess the variables at each step to determine the contribution of each to the predictive equation.

A set of four variables (knowledge base, skills, dispositions, and experience) was entered into the regression equation in a specific manner. Knowledge base was entered first because prior studies have shown a positive relationship between knowledge and critical thinking (Lynch, 1988; Thiessen, 1987). The critical thinking variables (skills and dispositions) were simultaneously entered next because there is no evidence in the literature stating that one develops before the other. Experience was entered last based on the logic that knowledge, skills, and dispositions make up the foundation formed in the educational process; refinement continues after graduation with the experience gained in the practice setting. Two hypotheses were explored: All the variables would contribute significantly to cognitive development, and the combination of variables would explain more of the variance at the commitment level than at either the dualistic or relativistic levels of cognitive development.

RESULTS

Description of the Sample

Of the 290 individuals who met the inclusion criteria and were interested in participating, 233 participants (80%) returned the completed questionnaires. One participant was dropped due to a lack of nursing experience. This resulted in a total sample size for this study of 232 registered nurses. The typical participant was female (91.8%), married (66.4%), baccalaureate-prepared (85.8%), certified (53.4%), and working in an acute care setting (62.1%). The mean age of the participants was 34.8 (± 6.5 SD). The mean number of hours worked per week was 36.5 (± 10.3 SD).

TABLE 1: Sample and Instrument Mean and Standard Deviation Scores

Instrument	Sample Mean/SD	Instrument Mean/SD
California Critical Thinking Skills Test		
Overall Score	17.22 (± 4.31)	16.4 (± 3.55) ^a
Critical Thinking Disposition Inventory		
Overall score	313.52 (± 34.69)	311.4 (± 23.71) ^a
Scale of Intellectual Development		
Dualism	72.78 (± 14.07)	73 (± 16) ^b
Relativism	58.94 (± 8.72)	63 (± 11)
Commitment	134.10 (± 10.90)	106 (± 10)

a. Aggregate data analysis results from senior nursing students (Facione, 1997).

b. Normative sample from college students (Erwin, 1981).

Critical thinking skills and critical thinking dispositions were no different in this sample when compared to instrument norms. All participants thought predominately at the commitment level of cognitive development, as evidenced by scoring highest in this dimension. The sample mean for commitment was significantly higher than the mean reported from a prior sample of college students, $t = 39.34$, $p < .05$ (Erwin, 1981), indicating that the individuals in this study had reached a higher developmental level. Participants also received a score, albeit lower, for each of the other two factors (dualism and relativism), indicating that these individuals probably do not function at the higher level of cognitive development in all situations. Mean scores on the instruments are displayed in Table 1 along with the standardized scores reported by the instrument authors.

Predictive Model Testing

The distribution for each of the three criterion variables—dualism, relativism, and commitment—was examined to assess the normality assumption that was tested with the Kolmogorov-Smirnov Test with a Lilliefors significance correction. Histogram distributions did not deviate markedly from normality.

Dualism. With dualism as the criterion variable and knowledge base as the first variable entered, 1.2% of the variation was explained, $F(2, 230) = 1.371$, $p = .256$. Significant incremental variance was obtained at the second step when critical thinking skills and dispositions were entered, F change (2, 228) = 19.375, $p < .05$, r^2 change = .14. Years in nursing failed to add incre-

mental variance in dualistic cognitive development over and above critical thinking skills and dispositions, F change (1, 227) = .068, p = .795, r^2 change = .000. With each of the four predictors (knowledge base, critical thinking skills, critical thinking dispositions, and experience) in the model, 15.6% of the variation was explained in dualism, $F(5, 227)$ = 8.37, p < .05. At the final step of entry, two predictors were significant—critical thinking skills (standardized beta = -.26, t = -4.125, p < .05) and critical thinking dispositions (standardized beta = -.245, t = -3.85, p < .05).

Multicollinearity of critical thinking skills and dispositions was carefully examined and not found to be problematic (Fox, 1991). The regression solution was assessed for outliers and influential data points using standardized residuals, hat elements (Draper & Smith, 1998; Stevens, 1996), Mahalanobis' Distance, and Cook's Distance. There were no data elements beyond the acceptable level.

Relativism. With relativism as the criterion variable and knowledge base as the first variable entered, 0.6% of the variation was explained, $F(2, 230)$ = .71, p = .49. Significant incremental variance was obtained at the second step when critical thinking skills and dispositions were entered, F change (2, 228) = 7.037, p < .05, r^2 change = .06. Years in nursing failed to add significant incremental variance in relativistic cognitive development, F change (1, 227) = .50, p = .48, r^2 change = .002. Overall, with each of the four predictors in the model, 6.6% of the variation in relativism was explained, $F(5, 227)$ = 3.21, p < .05. At the final step of entry, only one predictor, critical thinking dispositions, was significant (standardized beta = -.24, t = -3.63, p < .05).

Commitment. With commitment as the criterion variable and knowledge base as the first variable entered, 0.8% of the variation was explained, $F(2, 230)$ = .875, p = .42. Significant incremental variance was obtained at the second step when critical thinking skills and dispositions were entered, F change (2, 228) = 28.16, p < .05, r^2 change = .197. In this analysis, years in nursing added significant incremental variance in commitment, F change (1, 227) = 4.34, p < .05, r^2 change = .015. Overall, with each of the four predictors in the model, 21.9% of the variation in commitment was explained, $F(5, 227)$ = 12.74, p < .05. At the final step of entry, two predictors were significant—critical thinking dispositions (standardized beta = .46, t = 7.45, p < .05) and years in nursing (standardized beta = .12, t = 2.08, p < .05). The results of the three analyses are compared in Table 2. Knowledge base was a poor contributor to cognitive development, regardless of the level examined. Critical thinking dispositions and experience in nursing explained 21.9% of the variance in

TABLE 2: Standardized Betas and the Variation Explained for the Total Model

Cognitive Development	Knowledge Base	Critical Thinking Skills	Critical Thinking Dispositions	Experience in Nursing	Percentage of Variance Explained
Dualism	NS	Standardized beta = -.26	Standardized beta = -.245	NS	15.6%
Relativism	NS	NS	Standardized beta = -.24	NS	6.6%
Commitment	NS	NS	Standardized beta = -.46	Standardized beta = -.12	21.9%

NOTE: NS = not significant (p > .05).

commitment; 15.6% of the variance in dualism was explained by critical thinking skills and dispositions; and critical thinking dispositions alone accounted for the 6.6% variance explained in relativism. Analysis of the dependent variable of commitment was the only one in which nursing experience contributed to the variance explained.

DISCUSSION

A descriptive correlational study was conducted with a sample of practicing nurses to examine the influence that four variables (knowledge base, critical thinking skills, critical thinking dispositions, and experience) had on the development of the critical thinker. Knowledge base was not a significant predictor of any level of cognitive development. Academic knowledge provides understanding in an area of study and is expanded with experience in that field. After graduation, knowledge gained while in the nursing program probably is not used in its acquired state any longer; through nursing practice, it is transformed to experiential knowledge. This may explain why knowledge base was not a significant predictor of any level of cognitive development in this sample of practicing nurses.

Critical thinking disposition was a significant predictor of all three levels of cognitive development. This finding may reflect the sample that was baccalaureate-educated or that exposure to the university, and in particular the nursing environment, stimulates curiosity and openness to new ideas and differing perspectives. Critical thinking dispositions may be an essential ingredient of cognitive development, regardless of the level of development achieved.

Critical thinking skill was a significant predictor only at the dualistic level of thinking. This finding may be partially explained by the instrument, which presents situations about everyday life rather than questions specific to the nursing domain. Perhaps, when confronted with a situation that is totally unfamiliar, individuals resort to the mechanical skills (e.g., logical analysis) learned in past years. Those skills are taught early in the educational process. Once learned, they are relatively stable in memory and can be retrieved in novel situations that are complex (Reed, 1996).

The measurement of an individual's critical thinking skills ability is insufficient to judge the effectiveness of nursing education in producing nurses who use critical thought in practice. Dispositions towards critical thinking may support the ability to perform those skills, yet the thinker still may manifest a relatively immature level of cognitive development. That is,

an individual may score relatively well on a paper-and-pencil test designed to measure skills and dispositions but does not demonstrate the capability of transferring this ability into relevant critical thought, reasoned action, or sound decision making when called on to do so in clinical practice. If nursing educators must demonstrate the ability to produce graduates who are critical thinkers, they will need to find a way to measure the construct in a realistic and robust manner.

Nurses in this study reached the commitment level of cognitive development and had higher mean commitment level scores than reported by Erwin (1981) in the normative sample of college students, a discovery that suggests that experience is needed to reach the commitment level. The finding that experience was a unique predictor of the commitment level of cognitive development supported this conclusion.

The influence of experience on cognitive development is the essence of Perry's (1970) theory. Perry argues that cognitive development in college progresses in light of new experiences and new knowledge obtained during an educational program. He notes that this progression occurs slowly. Perry never extended his theory, however, beyond the educational setting to examine the effect of theoretical knowledge and work experience on cognitive development.

The results of this study suggest that perhaps the development of a critical thinker requires time and experience. If this is true, it may be unrealistic for schools of nursing to be held solely accountable for this process. Nursing education teaches specific critical thinking skills and encourages the disposition towards use of those skills through assignments, clinical experience, and exposure to role models. Educators should expect to see development of a student's critical thinking abilities, but achieving a particular outcome standard in critical thinking may not be the best criterion by which a program should be judged. Furthermore, the expectations held by hospitals and nursing staffs of new graduate nurses entering into practice needs to be tempered with knowledge of their developmental process.

The results of this study must be viewed in light of the strengths and limitations of this research. The strengths of this study include an adequate sample of practicing nurses. A thorough literature review helped to establish confirmation of causal relationships presumed on theoretical and empirical foundations. Potentially confounding variables such as curricular content and faculty were controlled through the use of graduates from a single institution. Use of only a baccalaureate nursing program controlled differences in expectations of graduates.

Limitations include the use of a nonrandom, convenience sample and cross-sectional data. Less than half of the accessible population responded to the mailed survey. In addition, relevant variables may have been omitted or irrelevant variables may have been included in the regression equation; there can never be absolute certainty that a specification error has not occurred (Schroeder, Sjoquist, & Stephan, 1986). Another limitation was the use of GPA as a measure of knowledge base. GPA probably does not adequately reflect true and complete knowledge. An additional limitation was the generic critical thinking skills tests that were used to measure the critical thinking skills of nurses. At present, there is no existing instrument measuring critical thinking skills specific to the domain of nursing. The fact that all of the participants demonstrated the ability to think at the level of commitment shows homogeneity of sample selection that may have compromised analysis.

More investigation is needed that examines the development of the critical thinker in nursing. Developing a specific critical thinking instrument for nurses would facilitate research in this area. The characteristics of those practicing nurses who have reached the level of commitment should be further explored to more thoroughly explain the variance in cognitive development. Longitudinal studies are needed to better understand this developmental process.

The results of this study support the contention that experience is needed to produce a critical thinker. These findings may influence policy regarding the criteria used to evaluate nursing education. Perhaps critical thinking, as currently measured, cannot be mandated as an outcome of formal education. It may be more appropriate to evaluate the critical thinking ability of staff nurses as an indicator of the success of formal education.

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Use of Videotaped Interventions in Research

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Evaluating conceptual and methodological issues are important considerations when developing a videotape for research intervention. The process of developing a videotape for research involves several critical steps to maintain scientific rigor during the project. Establishing content validity of the videotape script and maintaining scientific integrity while producing the videotape are key components. Issues such as copyright and intellectual property are important considerations. The use of videotape provides a consistent method of providing information to research subjects. Careful attention to the research process during each phase of development of the videotape will enhance the success of the project.

Videotapes have played an important role in health education for more than 20 years and have been used widely for education of both patients and health professionals. Research using a videotape as part of an educational intervention is plentiful; however, information on methodological issues in developing a videotape for a research study is rarely addressed in the literature. This article focuses on these issues and the importance of maintaining scientific rigor during videotape development.

There are a plethora of published articles describing the effectiveness of the videotape as a method of instruction. Gagliano (1988) provides a review of the efficacy of video programs used in research studies. These researchers report increased short-term knowledge after patients view a video intervention, but long-term knowledge retention continues to be problematic. More recent studies also show increased short-term knowledge with the use of videotaped intervention (Brown & Hanis, 1995; Giacoma, Ingersoll, & Williams, 1999; Lin, Lin, & Lin, 1997; Steinberg, Diercks, & Millspaugh, 1996; Volk, Cass, & Spann, 1999). The process a researcher uses to develop and test a videotape for research intervention is not well defined in the literature. A few authors describe the testing of a videotape within the context of an individual study (Brown, Duchin, & Villagomez, 1992; Israel & Mood,

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