

Developing Critical Thinking Skills in Nursing Students by Group Dynamics

S Khosravani, H Manoochehri, R Memarian

Citation

S Khosravani, H Manoochehri, R Memarian. *Developing Critical Thinking Skills in Nursing Students by Group Dynamics*. The Internet Journal of Advanced Nursing Practice. 2004 Volume 7 Number 2.

Abstract

The aim of this quasi-experimental study was to determine the effects of holding group-dynamic sessions in clinical training on critical thinking skills of baccalaureate nursing students. All 60 senior students were selected and randomly divided into two equal groups. Data collection tools included a demographic questionnaire and four forms of clinical reports based on nursing process. For students in the experimental group, selected topics on family health were discussed over 8-10 group-dynamic sessions, and for other students in the control group, routine educational program was performed. The scores of critical thinking skills were then compared in the two groups. T-test revealed a significant difference in total and partial scores of critical thinking skills in the two groups. Therefore, research hypothesis was supported. It can be concluded that applying "cooperative learning methods" appears to be helpful as a suitable approach in clinical training of nurses.

INTRODUCTION

The importance of critical thinking in nursing is so evident that educational programs are evaluated according to the development of skills related to this sort of thinking.

Numerous authors have underscored the need for nurses to be able to think critically in order to use the appropriate knowledge and skilled judgments in delivering patient care (Brooks & Shepherd, 1990; del Bueno, 1992; Ford & Profetto-McGrath, 1994; Krammer, 1993; Miller & Malcolm, 1990; Paul & Heaslip, 1995; Tschikato, 1993). They agree that critical thinking and decision-making skills are essential to the future of professional nursing.

In this regard, several definitions have been postulated to describe various and profound aspects of critical thinking in general and within the profession of nursing in particular. Critical thinking is a composite of attitudes, knowledge, and skills which includes: (1) attitudes of inquiry that involve an ability to recognize the existence of problems and an acceptance of the general need for evidence in support of what is asserted to be true; (2) knowledge of the nature of valid inferences, abstractions, and generalizations in which the weight or accuracy of different kinds of evidence are logically determined; and (3) skills in applying and applying the above attitudes and knowledge (Watson & Glaser, 1980).

Scheffer and Rubenfeld (2000) believed that the habits of the

mind of critical thinking in nursing include confidence, contextual perspective, creativity, flexibility, inquisitiveness, intellectual integrity, intuition, open-mindedness, perseverance, and reflection. Skills of critical thinking in nursing consist of analyzing, applying standards, discriminating, information seeking, logical reasoning, predicting and transforming knowledge (p. 352). Ennis (1985) described critical thinking as "reflective reasonable thinking..." (p.45). Varied perspectives of critical thinking exist in nursing. Kataoka-Yahiro and Saylor (1994) defined critical thinking as reflective and reasoned thinking about nursing problems without one solution, focused on decisions about what to believe and do. Another view is that critical thinking is the thought process that underlies effective clinical problem solving and decision-making (Oermann, 1997; Oermann and Gaberson, 1998).

Critical thinking is defined as purposeful, self-regulatory judgment; an interactive, reflective, reasoning process of making a judgment about what to believe or do (Facione & Facione, 1996). Critical thinking is the cognitive engine that drives the processes of knowledge development and critical judgment in nursing. The skills and dispositional attributes of critical thinking are central to nursing and that they embody a search for best knowledge in a given context. They demand an openness to new evidence and a willingness to reconsider judgments. They value a focused and diligent approach to clinical reasoning and they require a

tolerance of multiple perspectives when those perspectives can be supported by reason and evidence (Facione & Facione, 1994). Critical thinking opens doors to new perspectives about the world, fosters self-confidence, and encourages life-long learning (Chafee, 1994).

The ideal critical thinker is habitually inquisitive, well informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit (Facione, Facione, & Giancarlo, 1994).

Scholars believe that critical thinking cannot be developed by itself. Some of them contend that critical-thinking mastery is improved if developed and assessed within the context of a discipline (Blatz, 1989; McPeck, 1981, 1990a). McPeck asserted that critical thinkers evaluate information in light of background knowledge, context, and reflective skepticism (McPeck, 1981, 1990a) and postulated that it is impossible and incoherent to attempt to teach critical thinking in isolation from the skills being taught to students (McPeck, 1981). Further, Mc Peck noted that “truly suggestive, and therefore useful, thinking skills tend to be limited to specific domains or narrower areas of application” (McPeck, 1990a, p.12) and that “critical thinking is not a content-free general ability, nor is it a set of specific skills” (McPeck, 1990b, p.27).

Some nurse authors and educators (Alfaro-LeFevre, 1995; Brigham, 1993; Cascio, Campbell, Sandor, Rains, and Clark, 1995; Doona, 1995; Miller and Babcock, 1996; Miller and Malcolm, 1990) have described the context of critical thinking within the discipline of nursing. Alfaro-LeFevre (1995) asserted that “a key point to realize is that critical thinking is contextual... these skills require job-specific knowledge, and must be mastered within the context” (p. 35). Bandman and Bandman (1995) described the universality of critical thinking and their view of critical thinking as both subject-specific and general. Young (1998) stated, “in our hearts, we know what critical thinking is ... an individual who is able to respond to problems by using the nursing process effectively is a critical thinker” (p. 153).

Many nurse educators have written about teaching methods that reinforce critical thinking. Intensive strategies and suggestions for promoting critical-thinking skills in nursing

students have been developed and described by several nurse writers. Case (1994) suggested that to promote critical-thinking skills in learners, active dialogue between the instructor and the student was vital. Doona (1995) suggested that nursing education could expand the critical-thinking abilities of students by encouraging reflective thinking through such activities as writing of journals and using group discussion to explore alternatives and arrive at conclusions. Free (1997) used a critical-thinking game called What If? What Else? What Then? to encourage students to formulate alternatives to clinical or ethical decisions. Reynolds (1994) described a teaching tool called a “patho-flow diagram” (p. 333), designed to assist nursing students in connecting clinical events or decisions with information obtained in the classroom.

Nursing curricula (especially at the graduate level) should serve to free nursing students' minds and help them use their knowledge of higher-quality patient care and positive societal effects. Critical thinking can assist with insight into the societal conditions generating a patient's illness (Youngblood & Beitz, 2001). Teaching is really the development of cognition and metacognition and the belief that critical thinking can be nurtured with active learning (Flavell & Wellman, 1987). Active learning techniques are suggested to improve critical thinking development. Critical thinking is promoted by active learning strategies because of their cognitive triggering processes. In fact, active learning processes and critical thinking development are intimately related (Youngblood & Beitz, 2001).

To refine critical thinking in classroom and clinical settings, many techniques may be used including teacher and learner-group debates over clinical and ethical scenarios; cooperative learning techniques about clinical conundrums that encourage questions, analysis, and reflection; and using clinical reports to increase students' metacognition in hypothesis generation for common clinical experiences (Alexander & Giguere, 1996; Abegglen & Conger 1997; Bethune & Jackling, 1997; Castillo, 1999; Facione & Facione, 1996; Chenoweth, 1998; Fonteyn & Cahill, 1998; Kramer, 1993; Oermann, 1997; Wissman, 1996). Cooperative learning occurs when small groups of trainees work together to maximize their own and each other's learning (Gibson & Campbell, 2000). As a matter of fact, interpersonal relations are at the heart of the interface between individuals and groups (Marotta, Peters, & Paliokas, 2000).

Nursing faculties generally agree that students who know

how to think make better clinical judgments than those who have merely memorized facts. Theoretically, the acquisition of both critical thinking and clinical judgment begins with the education process (Brigham, 1993; Brooks & Shepherd, 1990). Benner, Tanner and Chelsa (1996) have conducted extensive nursing research that has evaluated critical thinking and clinical judgment skills. These authors use the term “clinical judgment” when referring to clinical decision-making. Miller and Malcolm (1990) actually defined critical thinking as clinical judgment. These authors believed clinical judgment was the outcome of thinking critically. More specifically, the subscales of inference and inductive reasoning had a positive correlation to clinical judgment (Bowles, 2000).

There is considerable agreement among nursing researchers that critical thinking is a vital component of successful nursing practice (Birn, 1993; Brigham, 1993; Jones and Brown, 1993; Pond, Bradshaw, and Turner, 1991; Miller and Malcolm, 1990; Pardue, 1987; Rubenfield and Scheffer, 1995; Tiessen, 1987; Woods, 1993). However, nurse researchers (Saarman, Freitas, Rapps, and Reigel, 1992; Hickman, 1993) have noted with concern the lack of discipline-specific assessment mechanisms to evaluate critical-thinking competency in nursing students. Hickman (1993) stated that: There is not a strong research base supporting a relationship between nursing curricula and critical thinking. It may be that this is due to the lack of an appropriate instrument to measure critical thinking in nursing (p. 46).

In fact, the evaluation of critical thinking has consistently received considerable attention in nursing education because of the requirement to produce outcome assessments of students' growth in these skills for accreditation purposes (Magnussen, Ishida, Itanu, 2000). Videbeck (1997) reports that the Watson Glaser Critical Thinking Appraisal (WGCTA) is the most widely used standardized test to measure critical-thinking skills of nursing students. Miller and Malcolm (1990) believed that the WGCTA appeared to be the most useful test for nursing because its emphasis on skills matches the need for practice ability in nursing. In addition, it has undergone 25 years of use, with resulting revisions and refinement. The WGCTA has been adopted and because of its established reliability, it can be easily administered and scored, and it has established norms and comparative data in the literature (Magnussen, Ishida, Itanu, 2000).

There have been disagreements in the literature about its

efficacy, however. McMillan (1987), after analyzing research reporting the use of WGCTA with nursing students, found that the studies had mixed results. One apparent drawback was it was difficult to separate the effects of maturation from the program effects. She suggests that the WGCTA is not sensitive enough to be used in this way and posits that it is not suitable to measure growth of critical thinking in professional settings because the test is based on daily life. In their study of the impact of nursing education on students' critical thinking ability, Gross, Takazawa, and Rose (1987) found that both associate degree and baccalaureate degree students showed improvement in critical thinking (as measured by the WGCTA) after completing their nursing education.

More recently, however, Vaughn-Wroebe, O'Sullivan, and Smith (1997) found no significant differences in the WGCTA scores between entry and end of the program. They speculated that five factors could explain the negative findings: 1) the test, itself, may not be the best measure; 2) the expectation of gains during the upper division courses might be erroneous (citing studies that report gains in critical thinking occur more frequently in freshman year than later); 3) the curriculum may not be designed to enhance critical thinking; 4) traditional teaching strategies may not encourage critical thinking and may not be inclined to complete to complete the test carefully when they are almost through with their studies. Other studies (Bauwens & Gerhard, 1987; Kintgen-Andrews, 1988; Adams, Stover, & Whitlow, 1999; Frye, Alfred, & Campbell, 1999) have also found no significant increase in WGCTA scores between entry and end of the program.

The possibility that the WGCTA is not a valid measure of nursing student ability was suggested in Adams' (1999) review of research on critical thinking. She concluded, “perhaps WGCTA is appropriate to measure general critical thinking ability and appropriate for generalized education such as liberal arts curriculum. However, nursing is a science and as such may be more accurately tested with a tool developed with that discipline in mind (Adams, 1999 p.117). Evaluation of critical thinking is best conducted by asking nurses to analyze a situation, identify alternatives, choose among them, and provide a sound rationale for these decisions. According to Morrison et al. (1996), a critical thinking test can ask about a type of thinking that requires knowledge of more than one fact to logically and systematically apply concepts to a clinical problem (p. 28).

It is important that introductory material be geared to the

levels of expertise and experiences of the nurse being evaluated. Using context-dependent items appropriate for novices with expert nurse may cause them to become bored and lose interest. On the other hand, using items appropriate for the competency testing of experienced nurses with novices may be overwhelming and frustrating for them (Oermann, Truesdell, & Ziolkowski, 2000). Different types of critical thinking exercises are available to be integrated in orientation and other educational programs: problem-solving strategies, case studies, discussions with Socratic questioning, debates, and media clips (Goodman, 1997). Test items may be of any format, but it should be noted that open-ended questions provide the most effective method of assessing the underlying thought processes involved. In writing the open-ended questions, the goal should be to assess nurses' underlying thought processes in arriving at the answers, not the answers alone. Reliance on true-false, short-answer, matching, and multiple-choice items may not capture nurses' abilities to engage in critical thinking about clinical situations they may face in their practice (Nitko, 1996).

Context-dependent test items can be developed to evaluate nurses' abilities to analyze simulated data, identify additional data needed, decide on all possible problems in the scenario, identify nursing interventions, and provide a rationale for their responses. One advantage of this type of testing is the opportunity to assess not only the decisions made but also the thought processes used to arrive at those decisions. The next step is to integrate these context-dependent items into, for example, educational program (Oermann, 1998). The types of scenarios developed as context-dependent items may be a typical patient, family, and other clinical situations nurses may face in practice; situations involving interactions with physicians, other health providers, and families; ethical issues; delegation and staffing problems; governance issues; and problems accessing resources and working within the health system. Context-dependent items may be developed for each content area in the educational program and may be used for formative evaluation and for testing (Oermann, 1997).

Along with exercises to promote critical thinking, context-dependent items may be integrated in tests developed for orientation and as part of competency testing. In a context-dependent test item, nurses are presented with introductory material to analyze and determine a course of action. The introductory material may be a description of a clinical situation, an issue they might face in their practice, or patient

data (Nitko, 1996). Graphs, flow sheets, EKG strips, or photographs might be part of this introductory material. The introductory material needs to provide sufficient information for analysis without directing the thinking process in a particular direction or being too long. Questions are then asked about this material (Oermann & Gaberson, 1998).

PURPOSE

This quasi-experimental study was conducted to determine the effects of group-dynamic sessions on critical thinking skills of baccalaureate nursing students. The purpose of the research was to identify whether students could develop their critical thinking abilities after participating in these sessions as a teaching strategy.

METHODS

All 60 senior nursing students in Shaheed Beheshti Faculty of Nursing and Midwifery were selected and randomly divided into two equal control and experimental groups. These students passed their clinical training in health clinics affiliated to the university. The subjects voluntarily participating in the study were between 22 and 24, with similar educational record. They were matched according to age, sex, term of study and passed units. No student was excluded during the research.

Research hypothesis was: "the critical thinking skills of nursing students passing their community health training by participating in group-dynamic sessions would increase compared with those of the control group".

A questionnaire consisted of 12 questions and four clinical report forms to evaluate critical thinking skills were used for data collection. The forms were designed according to nursing process steps (Assessment, Diagnosis, Planning, and Evaluation) with a space provided to write clinical reasoning in each stage. Validity of the questionnaire was determined by content validity and internal reliability was measured by internal consistency (internal consistency: 99.95). To identify reliability in rating, an inter-rater reliability was measured (interrater reliability: 0.88).

It was supposed that by applying nursing process to analyze data, find different problems of clients, and provide the reasons behind any comment, suggestion or solution, students could reach to high levels of cognition according to Bloom's taxonomy and such activities could improve critical thinking abilities. According to Morrison and Walsh Free (2001), questions that require calculation or ask what is the best, most important, first, highest priority, and so forth,

require a high level of discrimination to answer, and therefore promote critical thinking. Such multilogical test items require the ability to relate and apply concepts to clinically-oriented situations and measure the students' ability to think critically within the discipline of nursing.

Each group was further divided into four subgroups with seven or eight members. For the experimental subgroups (two seven-member and two eight-member subgroups), eight to ten group-dynamic sessions, each lasted 1 to 1.5 hours, were held two days a week with at least a two-day interval. The topics of the sessions were chosen from the concepts of family health to be discussed over one or two sessions. A leader in the group involved the members by asking their views about the selected topic and discussing about it from different perspectives. The roles of community health nurse were discussed by each member to identify different aspects and probable problems, and appropriate ways or solutions were identified by providing reasons or arguments. At the end of each session, the topics of the next session as well as the leader of the group were announced by researchers.

For each subgroup, 8-10 sessions were held over 25 days and the whole intervention was completed during 5 months. Having clinical conferences and home visits, the control group passed their routine training. The researchers visited students in the experimental group once a week in the clinics to deliver new forms and solve any possible trouble regarding the completion of forms. These students completed their clinical forms in accordance with the sessions and assessment of families during their visits (one form in each week). On the other hand, students in the control group delivered their forms at the end of their course and assessment of families. They were guided to contact with the researchers as necessary to solve any problem or clarify any misunderstanding in the completion of forms. The groups did not have any communication or relation with each other.

About two weeks after the last session, all of the forms from both groups were collected and scored in single-blind format by using a devised scale. To score critical thinking abilities in the students of both groups, mean scores of responses to questions in each area including seeking information (1 point), diagnosis (2 points), clinical reasoning (9 points), clinical judgment (6 points), prediction (1 point), and creativity (1 point) were calculated as the score of each ability. The range of scores was between 0 and 20.

RESULTS

Findings revealed that the majority of students in both groups were female and unmarried, with no occupation or experience at group work. They mostly lived with their parents. Chi-square and Mann-Whitney tests showed no significant difference between the two groups in the above variables as well as age, average score of the previous term and units passed ($P>0.05$).

Table 1 shows the mean scores of clinical report forms in both groups. Paired t-test showed a significant difference between the scores of the control and experimental groups ($P = 0.0001$). In table 2, the mean scores of each critical thinking skill in both groups are presented. Mann-Whitney test and t-test showed a significant difference between the scores of the two groups, except for seeking information ($P = 0.0001$). Table 3 provides the total scores of critical thinking abilities in both groups. These scores showed a significant difference between the control and experimental groups, verified by paired t-test ($P = 0.0001$). Additionally, diagram 1 shows the difference between critical thinking abilities in both groups.

Figure 1

Table 1: Mean scores of clinical report forms in the control and experimental groups

Group Subscales	Control	Experimental	Significance (S, NS)* U-/t-tests Results
Seeking information (1point)	0.60	0.75	NS, U=315, P=0.02
Diagnosis (2 points)	0.87	1.73	S, t=4.44, P=0.0001
Clinical reasoning (9 points)	2.07	5.06	S, t=5.80, P=0.0001
Clinical judgment (6 points)	2.45	3.68	S, t=3.89, P=0.0001
Prediction (1 point)	0.47	0.82	S, U=136.5, P=0.0001
Creativity (1 point)	0.46	0.82	S, U=240, P=0.0001

* S = Significant, NS = Not Significant; † = Mann-Whitney U test

Figure 2

Table 2: Mean scores of critical thinking subscales in the control and experimental groups

Group Report Forms	Control	Experimental	Significance (S, NS) * (t-test results)
1 st Report (5 scores)	1.88	3.9	S, t=7.43, P=0.0001
2 nd Report (5 scores)	2.18	3.34	S, t=4.12, P=0.0001
3 rd Report (7 scores)	2.84	4.59	S, t=4.04, P=0.0001
4 th Report (3 scores)	1.18	2.01	S, t=4.19, P=0.0001

* S = Significant, NS = Not Significant

Figure 3

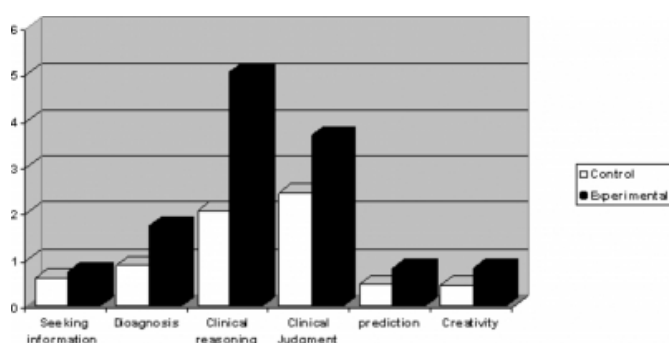
Table 3: Mean total scores of critical thinking in the control and experimental groups

Group	Control	Experimental	Significance*
Total score	8.03	13.83	S, t=5.9, P=0.0001

* S = Significant, NS = Not Significant

Figure 4

Diagram 1: Mean scores of critical thinking subscales in both groups



DISCUSSION

Studies have shown that a positive correlation exists between age, academic educational background as well as clinical experience and scores of critical thinking abilities (Scheffer & Rubenfeld, 2000). Since demographic variables have been shown to be effective on critical thinking, the groups were matched in our study to avoid unwanted effects of intervening variables.

Bowles (2000) found a positive relationship between critical thinking and clinical-judgment abilities in baccalaureate nursing students. According to Loving (1993), the concept of critical thinking encompasses problem-solving, decision-making, clinical judgment, and creativity. All of these abilities were assessed and measured by the clinical report forms devised in this study and the researchers believe that they have been able to appraise critical thinking skills. Thus, the hypothesis of the study was supported with respect to the significant difference between the total scores of critical thinking abilities of the two groups.

Magnussen, Ishida, and Itano (2000) have showed that inquiry-based learning as a teaching methodology can develop critical thinking abilities. In addition, it has been indicated that these abilities are not developed during routine educational programs of nursing, which reveals the ineffectiveness of traditional teaching models in this regard.

This is similar to our study in terms of assessing the impact of a cooperative learning method (group dynamics) on improving these abilities and changing the routine lecture-based educational programs. In fact, it appears that the effect of cooperation on the process of learning is so evident that such significant improvements can be observed in our study.

Many scholars believe that general tools for assessing critical thinking in students are not appropriate since it is a discipline-specific phenomenon and should be evaluated within the construct of its related discipline (Scheffer & Rubenfeld, 2000; Morrison & Walsh Free, 2001). Hence, this study presents a newly devised tool to assess critical thinking development in nursing as a specific discipline. The nursing process embedded in the questions of the tool can be considered as a framework for critical thinking with such skills as analyzing, applying standards, discriminating, logical reasoning, predicting, and transforming knowledge. The open-ended questions based on the concepts of family in community health nursing provided a challenge according to the students to use these skills and to improve their critical thinking abilities.

The scores of "seeking information" in both groups had no significant difference while, in all other abilities, a significant difference was found. This may be due to allocation of low score (1 point) to assessment, which has statistically brought about no significant difference. In fact, further studies in other courses of nursing with greater number of samples and specifically designed tools are needed to have more definite and conclusive findings regarding critical thinking.

It is evident that new learning methods should be applied to nursing education to generate nurses with powerful judgment and, therefore, skillful practice. Thinking and practicing are not dividable and the latter follows the former. Thinking allows nurses to find out what types of care should be provided and what activities should be performed with respect to clients' condition. All thinking abilities should be used in planning, diagnosing, and providing nursing care (Rubenfeld & Scheffer, 1995) and critical thinking is important in different aspects of nursing such as knowing, diagnosing, and bridging the gap between theory and practice (Clark & Hott, 2001).

It can be concluded that the more educators provide scenes for better and deeper thinking, the better learners can understand and analyze phenomena in the surrounding world to be better thinkers for better life.

ACKNOWLEDGEMENTS

We would like to thank the administrative staff of Tarbiat Modarres University and Shaheed Beheshti Faculty of Nursing and Midwifery for their assistance and cooperation. We would also like to express our gratitude to Ms. Kamelia Rouhani, community health nursing instructor in Shaheed Beheshti Faculty of Nursing and Midwifery, for her sincere cooperation during the implementation of the study. Finally, we are indebted to all students who participated in the study with full cooperation.

CORRESPONDENCE TO

Dr. H. Manoochchri, Dr.HoumanManoochchri@gmail.com

References

- r-0. Abegglen, J., & Conger, C. (1997). Critical thinking in nursing: classroom tactics that work. *Journal of Nursing Education*, 36(10), 452-458.
- r-1. Adams, B.L. (1999). Nursing education for critical thinking: An integrative review. *Journal of Nursing Education*, 38(3), 111-119.
- r-2. Adams, M.H., Stover, L.M., & Whitlow, J.F. (1999). A longitudinal evaluation of baccalaureate nursing students' critical thinking abilities. *Journal of Nursing Education*, 38(3), 139-141.
- r-3. Alexander M.K., & Giguere B. (1996). Critical thinking in clinical learning: a holistic perspective. *Holistic Nursing Practice*, 10(3), 15-22.
- r-4. Alfaro-LeFevre, R. (1995). *Critical thinking in nursing: A practical approach*. Philadelphia: W. B. Saunders.
- r-5. Bandman, E.L., & Bandman, B. (1995). *Critical thinking in nursing*. Norwalk, CN: Appleton and Lange.
- r-6. Bauwens, E.E., & Gerhard, G.G. (1987). The use of the Watson-Glaser Critical Thinking Appraisal to predict success in a baccalaureate nursing program. *Journal of Nursing Education*, 26(7), 278-281.
- r-7. Benner, P., Tanner, C., and Chelsa, C. (1996). *Expertise in nursing practice; caring, clinical judgment, and ethics*. New York: Springer Publishing Company.
- r-8. Bethune, E., & Jackling, N. (1997). Critical thinking skills: the role of prior experience. *Journal of Advanced Nursing*, 26, 1005-1012.
- r-9. Birx, E. (1993). Critical thinking and theory-based practice. *Holistic Nursing Practice*, 7(2), 21-27.
- r-10. Blatz, C.V. (1989). Contextualism and critical thinking: Programmatic investigations. *Educational Theory*, 39(2), 107-119.
- r-11. Bowles, K. (2000). The relationship of critical-thinking skills and the clinical-judgment skills of baccalaureate nursing students. *Journal of Nursing Education*, 39(8), 373-376.
- r-12. Brigham, C. (1993). Nursing education and critical thinking: Interplay of content and thinking. *Holistic Nursing Practice*, 7(1), 48-54.
- r-13. Brigham, C. (1993). *Critical thinking in nursing students progressing through a nursing curriculum*. Munice: Ball State University; 1989, Dissertation.
- r-14. Brooks, K., & Shepherd, J. (1990). The relationship between clinical decision-making skills in nursing and general critical thinking abilities of senior nursing students in four types of nursing programs. *Journal of Nursing Education*, 29(4), 391-399.
- r-15. Case, B. (1994). Walking around the elephant: A critical thinking strategy for decision making. *Journal of Continuing Education in Nursing*, 25, 101-109.
- r-16. Cascio, R., Campbell, D., Sandor, M., Rains, A., & Clark, M. (1995). Enhancing critical thinking skills. *Nurse educator*, 20(3), 38-43.
- r-17. Castillo, S. (1999). *Strategies, Techniques, and Approaches to Thinking: Case Studies in Clinical Nursing*. Philadelphia: Saunders.
- r-18. Chafee, J. Teaching for critical thinking. *Educational Vision*, 2(1), 24-25.
- r-19. Chenoweth, L. (1998). Facilitating the process of critical thinking for nursing. *Nurse Education Today*, 18, 281-292.
- r-20. Clark, D.J.; & Hott, J. (2001). Philosophy: A key to open the door to CT. *Nurse Education Today*, 21(2), 171-178.
- r-21. del Bueno, D. (1992). Experience, education, and nurses ability to make clinical judgments. *Nursing and Health Care*, 11(6), 290-293.
- r-22. Doona, M.E. (1995). Nurses' judgment as they care for persons who exhibit impaired judgment: A phenomenological study. *Journal of Professional Nursing*, 11, 98-109.
- r-23. Ennis, R. H. (1985). A logical basis for measuring critical thinking skills. *Educational Leadership*, 43, 44- 48.
- r-24. Facione, N., & Facione, P. (1996). Externalizing the critical thinking in knowledge development and clinical judgement. *Nursing Outlook*, 44(3), 129-136.
- r-25. Facione, N., & Facione, P. (1994). *Holistic critical thinking scoring rubric*. Millbrae, CA: California Academic Press.
- r-26. Facione, N., Facione, P., & Giancarlo, MA. (1994). Critical thinking disposition as a measure of competent clinical judgment: The development of the California Critical Thinking Disposition Inventory. *Journal of Nursing Education*, 33(8), 345-350.
- r-27. Facione, N., & Facione, P. (1996). Assessment design issues for evaluating critical thinking in nursing. *Holistic Nursing Practice*, 10(3), 41-53.
- r-28. Flavell, J. & Wellman, H. (1987). *Perspectives on the development of Memory and Cognition*. New York: Wiley.
- r-29. Fonteyn, M., & Cahill, M. (1998). The use of clinical logs to improve nursing students' metacognition: a pilot study. *Journal of Advanced Nursing*, 28(1), 149-154.
- r-30. Ford, J., & Profetto-McGrath, J. (1994); A model for critical thinking within the context of curriculum as praxis. *Journal of Nursing*, 33(8), 341-344.
- r-31. Free, K. (1997). Teaching tools: What If? What Else? What Then? A critical thinking game. *Nurse Educator*, 22(5), 9-12.
- r-32. Frye, B., Alfred, N., & Campbell, M. (1999). Watson-Glaser Critical Thinking Appraisal with BSN students. *Nursing and Health Care Perspectives*, 20(5), 253-255.
- r-33. Gibson, D., & Campbell, R. (2000). The role of cooperative learning in the training of junior hospital doctors: a study of paediatric senior house officers. *Medical Teacher*, 22(3), 297-300.
- r-34. Goodman, D. (1997). Application of the critical pathway and integrated case teaching method to nursing orientation. *The Journal of Continuing Education in Nursing*, 28(5), 205-210.
- r-35. Gross, Y.T., Takazawa, E.S., & Rose, C.L. (1987). Critical thinking and nursing education. *Journal of Nursing Education*, 32(9), 406-414.
- r-36. Hickman, J.S. (1993). A critical assessment of critical thinking in nursing education. *Holistic Nursing Practice*, 7, 36-47.

- r-37. Jones, S. & Brown, L. (1993). Alternative views on defining critical thinking through the nursing process. *Holistic Nursing Practice*, 7, 71-76.
- r-38. Kataoka-Yahiro, M., & Saylor, C. (1994). A critical thinking model for nursing judgment. *Journal of Nursing Education*, 33(8), 351-356.
- r-39. Kingten-Andrews, J. (1988). Development of critical thinking: career ladder P.N. and A.D. nursing students, prehealth science freshman, generic baccalaureate sophomore nursing students (Resources in Education, 24(1) ERIC Document No. 297153).
- r-40. Krammer, M. (1993). Concept clarification and critical thinking: An integrated process. *Journal of Nursing Education*, 32(9), 406-414.
- r-41. Loving, G. (1993). Competence validation and cognitive flexibility: A theoretical model grounded in nursing education. *Journal of Nursing Education*, 32(9), 415-421.
- r-42. Magnussen, L., Ishida, D., & Itano, J. (2000). The impact of the use of inquiry-based learning as a teaching methodology on the development of critical thinking. *Journal of Nursing Education*, 39(8), 360-364.
- r-43. Marotta, S., Peters, B., & Poliokas, K. (2000) Teaching group dynamics: An interdisciplinary model. *Journal for Specialists in Group Work*, 25(1), 16-28.
- r-44. McMillan, J. (1987). Enhancing college students' critical thinking: A review of studies. *Research in Higher Education*, 26(1), 3-29.
- r-45. McPeck, J. E. (1981). *Critical thinking and education*. New York: St. Martin's Press.
- r-46. McPeck, J. E. (1990a). Critical thinking and subject specificity: A reply to Ennis. *Educational Researcher*, 4(2), 10-12.
- r-47. McPeck, J.E. (1990b). *Teaching critical thinking*. New York: Routledge.
- r-48. Miller, M.A., & Babcock, D.E. (1996). *Critical thinking applied to nursing*. St. Louis: Mosby.
- r-49. Miller, M.A., & Malcolm, N.S. (1990). Critical thinking in the nursing curriculum. *Nursing and Health Care*, 11(7), 67-73.
- r-50. Morrison, S., Smith, P., & Britt, R. (1996). *Critical thinking and test item writing*. Houston: Health Education Systems, Inc.
- r-51. Morrison, S., & Walsh Free, K. (2001). Writing multiple-choice test items that promote and measure critical thinking. *Journal of Nursing Education*, 40(1), 17-24.
- r-52. Nitko, A.J. (1996). *Educational assessment of students*. Englewood Cliffs, NJ: Prentice Hall.
- r-53. Oermann, M.H. (1997). Evaluating critical thinking in clinical practice. *Nurse Educator*, 22(5), 25-28.
- r-54. Oermann, M.H. (1998). How to assess critical thinking in clinical practice. *Dimensions of Critical Care Nursing*, 17(6), 322-327.
- r-55. Oermann, M.H., & Gaberson, K. (1998). *Evaluation and testing in nursing education*. New York: Springer.
- r-56. Oermann, M.H., Truesdell, S., & Ziolkowski, L. (2000). Strategy to assess, develop, and evaluate critical thinking. *The Journal of Continuing Education in Nursing*, 31(4), 155-161.
- r-57. Paul, R., & Heaslip, P. (1995). Critical thinking and intuitive nursing practice. *Journal of Advanced Nursing Practice*, 22, 40-70.
- r-58. Pardue, S.F., (1987). Decision-making skills and critical thinking ability among associate degree, diploma, baccalaureate, and master's-prepared nurses. *Journal of Nursing Education*, 26, 354-361.
- r-59. Pepa, C.A., Brown, J.M., & Alverson, E.M. (1997). A comparison of critical thinking abilities between accelerated and traditional baccalaureate nursing students. *Journal of Nursing Education*, 1, 46-48.
- r-60. Pond, E.F., Bradshaw, M.J., & Turner, S.L. (1991). Teaching strategies for critical thinking. *Nurse Educator*, 16(3), 18-22.
- r-61. Reynolds, A. (1994). Patho-flow diagramming: A strategy for critical thinking and clinical decision making. *Journal of Nursing Education*, 33, 333-336.
- r-62. Rubenfeld, M.G., & Scheffer, B.K. (1995). *Critical thinking in nursing: An interactive approach*. Philadelphia: J. B. Lippincott.
- r-63. Saarman, L., Frietas, L., Rapps, J., & Riegel, B. (1992). The relationship of education to critical thinking ability and values among nurses: Socialization into professional nursing.
- r-64. Scheffer, B.K., & Rubenfeld, M.G. (2000). A consensus statement on critical thinking in nursing. *Journal of Nursing Education*, 39(8), 352-359.
- r-65. Thompson, C., & Rebesch, L. (1999). Critical thinking skills of baccalaureate nursing students at program entry and exit. *Nursing and Health Care perspectives*.
- r-66. Tiessen, J.B. (1987). Critical thinking and selected correlates among baccalaureate nursing students. *Journal of Professional Nursing*, 3, 118-123.
- r-67. Tschikota, S. (1993). The clinical decision making process of student nurses. *Journal of Nursing Education*, 32(9), 389-397.
- r-68. Videbeck, S. (1997). Critical thinking: Prevailing practice in baccalaureate schools of nursing. *Journal of Nursing Education*, 35(1), 5-10.
- r-69. Vaughn-Wroebel, B.C., O'Sullivan, P., & Smith, L. (1997). Evaluating critical thinking skills of baccalaureate nursing students. *Journal of Nursing Education*, 36(10), 485-488.
- r-70. Watson, G., Glaser, E.M. (1980). *Watson-Glaser critical thinking appraisal manual*. San Antonio: The Psychological Corporation: Harcourt Brace Jovanovich, Inc.
- r-71. Wissman, J. (1996). Strategies for teaching critical thinking in pharmacology. *Nurse Educator*, 21(1), 42-46.
- r-72. Woods, J.H. (1993). Affective learning: One door to critical thinking. *Holistic Nursing Practice*, 7, 64-70.
- r-73. Young, D. (1998). The importance of critical thinking. (Letter to the editor). *Journal of Nursing Education*, 37(4), 153.
- r-74. Youngblood, N., & Beitz, J.M. (2001). Developing critical thinking with active learning strategies. *Nurse Educator*, 22(5), 9-12.

Author Information

Setareh Khosravani, MSN, RN

Alumnus of Tarbiat Modarres University

Houman Manoochehri, PhD, MSN, RN

Faculty member, Faculty of Nursing and Midwifery, Shaheed Beheshti University of Medical Sciences and Health Services

Robabeh Memarian, MSN, RN

Assistance Professor, Tarbiat Modarres University