Critical Thinking Theory and Nursing Education

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Abstract

Thinking can be also defined as the mental manipulation of sensory input and recalled perceptions to formulate thoughts. Critical thinking "thinking explicitly aimed at well-founded judgment, utilizing appropriate evaluative standards in an attempt to determine the true worth, merit, or value of something". As previously discussed, there have been a number of theorists and experts in critical thinking who have described critical thinking in a variety of ways. Major Theorists provides an overview of many of the theorists' definitions of critical thinking, followed by brief discussion of the major theorists' views about critical thinking. As nursing students grow in the knowledge of the discipline within the classroom, encounter more acutely ill patients, increased technology, and complex ethical issues within the clinical setting, one would expect they would grow in skills of critical thinking.

Key Words: Critical Thinking Theory, Nursing Education, Critical Thinking.

CRITICAL THINKING THEORY

Critical thinking theory finds its roots in ancient Greek philosophers who sought to approach truth by means of critical discussion. A critical discussion is one in which ideas are pitted against one another. The underlying belief is that it is only through criticism and critical discussion that we can get nearer to the truth (Norris, Phillips, 1987). In education, critical thinking theory is grounded in John Dewey's idea of reflective thinking. Dewey made a distinction between process and product in thinking. He defined "reflective thinking" as "active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tends includes a conscious and voluntary effort to establish belief upon a firm basis of evidence and rationality".

Reflective thinking is stimulated by a "perplexed" situation that prompts guesses about how to resolve it. The rational problem solver pauses to formulate the problem and develop a hypothesis. Observation and reason guide testing and refinement of the hypothesis. Dewey insisted that these processes are not linear but recursive and mutually influential. Dewey further sustained that judgement is reflective thinking turned to controversy, "selecting and weighing the bearing of facts and suggestions as they present themselves, as well as deciding whether the alleged facts are really facts and whether the idea used is a sound idea". Dewey compared memory to a refrigerator; he said that it provides "a stock of meanings for future use, but judgement selects and adopts the one to be used in an emergency". He believed that education could either help or hinder development of problem solving and judgement. He advocated education based on the scientific method, emphasizing students' interests and integrating experience and reflection with learning content (Dewey, 1910).

As previously discussed, there have been a number of theorists and experts in critical thinking who have described critical thinking in a variety of ways. The definitions and conceptualizations of critical thinking of the major theorists are described in this section. Major Theorists provides an overview of many of the theorists' definitions of critical thinking, followed by brief discussion of the major theorists' views about critical thinking.

Edward Glaser (1941) Watson & Glaser (1991): "1) an attitude of being disposed to consider in a thoughtful way the problems and subjects that come within the range of one's experiences, 2) knowledge of the methods of logical inquiry and reasoning, and 3) some skill in applying those methods". '...a composite of attitudes, knowledge, and skills that include: 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 abstractions and generalizations in which the weight of accuracy of different kinds of evidence is logically determined; 3) Skills in employing and applying the above attitudes and knowledge" (Watson & Glaser, 1991)

John McPeck (1981) : "...skill and propensity to engage in an activity with reflective skepticism...it is discipline-specific...that is, requires knowledge of the subject or domain". (McPeck, 1981)

Robert Ennis (1985) : "Critical thinking is reasonable, reflective thinking focused on deciding what to believe or do" (Ennis, 1985)

Stephen Norris (1985) : "...implies assessing the views of other and one's own views according to acceptable standards of appraisal"... a productive process resulting in making rational choices based on reliable observation, sound inferences, and reasonable hypotheses.. .requires both the skill to think critically and the "disposition to think productively and critically". (Norris, 1985)

Meyers (1986) : ...a central element of critical thinking is the ability to raise relevant questions and critique solutions without necessarily posing alternatives (Meyers, 1986)

Stephen Brookfield (1987): …entails much more than the skills of logical analysis... it is a productive, positive process of calling into question the assumptions underlying our customary, habitual ways of thinking and acting, and then being ready to think and act differently on the basis of this critical questioning... it is exhibiting "reflective skepticism"(Brookfiled, 1987, PP 5-9)

Matthew Lipman (1988) : "Critical thinking is skillful, responsible thinking that facilitates good judgment because it 1) relies upon criteria, 2) is self-correcting, and 3) is sensitive to context" (Lippman, 1988)

J.G. Kurfiss(1988) : .. .an investigation whose purpose is to explore a situation, phenomenon, questions, or problem to arrive at a hypothesis or conclusions about it that integrates all available information and that therefore can be convincingly justifies (Kurfiss, 1988)

Diane Halpern (1989) :"...thinking that is purposeful, reasoned, and goal directed... the kind of thinking involved in solving problems, formulating inferences, calculating likelihood, and making decisions"...includes an evaluation component, a "constructive consideration of positive and negative attributes...and outcomes" (Halpern, 1989)

John Chaffee (1992): "...goes beyond developing intellectual abilities...it also involves developing basic attitudes and dispositions. In a way, it's a whole philosophy of life, a process of personal transformation" (Chaffee, 1992)

Richard Paul (1992): ".. .thinking about your thinking while you are thinking to make your thinking better... it is self-improvement in thinking through standards that assess thinking" (Paul, 1992). The essential components of critical thinking include elements of thought, thinking abilities, affective traits, and intellectual standards (Paul, 1993)

Peter Facione (1998): ".. .the process of purposeful, self-regulated judgment giving reasoned consideration to evidence, contexts, conceptualizations, methods, and criteria" (Facione, 1998)

Watson & Glaser. The "cornerstone for the critical thinking movement" was laid in 1941 with the publication of Edward Glaser's "foundational book", *An Experiment in the Development of Critical Thinking* (Paul, 1993). A pioneer in the conceptualization and measurement of critical thinking, Glaser's definition of critical thinking focused on a composite of knowledge, attitudes, and skills. In 1964, he and colleague Watson developed the Watson-Glaser Critical Thinking Appraisal (WGCTA), a multiple choice critical thinking test designed to measure the critical thinking sub-skills: inference, recognition of assumptions, deduction, interpretation, and evaluation of arguments (Adams et al, 1996; Watson & Glaser, 1991). Over the years they refined their instrument and definition of critical thinking, retaining the original components. They most recently defined critical thinking as: .. .a composite of attitudes, knowledge and skills that include: 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 abstractions and generalizations in which the weight of accuracy of different kinds of evidence is logically determined; 3) skills in employing and applying the above attitudes and knowledge (Watson & Glaser, 1991).

Although the oldest, most established, and most widely used critical thinking test, the WGCTA has been criticized. McPeck (1990) specifically challenged the validity of the Watson Glaser Critical Thinking Appraisal and other tests that purported to measure critical thinking as a "general ability that can be measured independently of context and subject matter'. He viewed the Watson Glaser correlation coefficients with intelligence tests as too high, indicating that the two tests were measuring the same general ability rather than two different abilities. McDaniel and Lawrence (1990) stated that Watson-Glaser reliability coefficients were "quite low" and that the "only evidence of validity reported in the manual is correlations with measures of school skills and intelligence".

Robert Ennis. Robert Ennis defined critical thinking as "reasonable, reflective thinking that is focused on deciding what to believe or do" (Ennis, 1985). His definition also involved a number of dispositions and abilities deemed important for critical thinking, as outlined following;

Critical Thinking Dispositions and Abilities

A. Dispositions

1. Seek a clear statement of the thesis or question
2. Seek reasons
3. Try to be well informed
4. Use credible sources and mention them
5. Take into account the total situation.
6. Try to remain relevant to the main point.
7. Keep in mind the original or basic concern.
8. Look for alternatives.
9. Be open-minded.
10. Take a position when the evidence and reasons are sufficient to do so.
11. Seek as much precision as the subject permits.
12. Deal in an orderly manner with the parts of a complex whole.
13. Use one's critical thinking abilities.
14. Be sensitive to the feelings, levels of knowledge, and degree of sophisticated of others.

B. Abilities

Elementary Clarification

1. Focusing on a question
2. Analyzing arguments
3. Asking and answering questions of clarification and challenge

Basic support

4. Judging the credibility of a source
5. Observing and judging observation reports

Inference

6. Deducing and judging deductions
7. Inducing and judging inductions
8. Making and judging value judgments

Advance Clarification

9. Defining terms and judging definitions
10. Identifying assumptions

Strategy and Tactics

11. Deciding on an action
12. Interacting with others

Ennis, together with his colleagues Millman and Tomko, developed the Cornell Critical Thinking Test, available in two forms aimed at differing age groups. On this test, respondents read arguments presented in a "point-counterpoint" format, then were asked to determine if, (1) conclusions follow necessarily from the statements, (2) conclusions contradicts the statements, or (3) neither. Although this test avoided multiple-choice questions in an attempt to give respondents more latitude in their answers, responses were limited to an evaluation of thought processes presented in test items (McDaniel, Lawrence, 1990,). Ennis later worked with colleague Weir to develop the Ennis-Weir Critical Thinking Essay Test in an attempt to "give respondents more freedom in evaluating arguments and assessing statements" (McDaniel, Lawrence, 1990). In this test, respondents constructed an essay to respond to arguments presented in a "letter to the editor" about a parking situation in a fictitious city. Responses were graded according to guidelines provided, primarily measuring processes based on rules of logical reasoning: "getting the point, seeing the reasons and assumptions, stating one's point, offering good reasons, seeing other possibilities, and responding appropriately to...logical arguments" (Adams et al, 1996; McDaniel, Lawrence, 1990).

John McPeck. John McPeck defined critical thinking as "the skill and propensity to engage in an activity with reflective skepticism". In 1990, McPeck argued that critical thinking was not a general ability, nor was it a set of discrete skills. Instead, he conceptualized critical thinking as including both a knowledge component and a critical component. He saw the "knowledge component" as relevant domain specific knowledge required for critical thinking within a field, and the "critical component" as the ability to "question effectively and suspend judgment or belief until sufficient information was available to make a valid judgment.. In other words, he thought that "relevant knowledge and information" was as crucial to critical thinking as the cognitive skills involved in critical thinking (McPeck, 1990). McPeck also questioned the different kinds of reasoning and thinking required of different fields or domains of knowledge, emphasizing the contextual nature of critical thinking skills.

He wrote:

Not only are the canons of validity different, but what might be fallacious reasoning in one context or domain, might be perfectly correct in another. This fact about the different forms of thought casts serious doubt about the interfield validity of any small set of specific trainable skills. However, if we could find some common elements of reasoning that apply equally across fields or domains, we would still have to ask whether these common elements are sufficient to enable one to make the required critical judgments that various problems require (McPeck, 1990). In support of his views, McPeck specifically challenged the validity of the WGCTA and other tests that measured critical thinking as a context and discipline independent general ability. For example, Watson and Glaser cited the high correlation coefficients of their critical thinking test with established tests of intelligence as evidence of WGCTA validity. However, McPeck concluded that the tests correlated so highly with one another that they appeared to be measuring the same general ability as intelligence tests...not two different abilities.

Harvey Siegel. Harvey Siegel viewed critical thinking as both a general ability and subject specific, defining it as thinking that generated and sought out good reasons (Siegel, 1980). He identified three imperatives for teaching critical thinking: 1) to facilitate students' self-sufficiency and autonomy in judging and acting on the basis of reasoned appraisal; 2) to empower students, encouraging them to ask questions, look for evidence, seek and scrutinize alternatives, and to be critical of their own ideas as well as those of others; and 3) to promote reasoning that holds to standards that are impartial and universal (Seigel, 1985).

Richard Paul. Richard Paul is recognized as a major leader in the international critical thinking movement and is the Director of the Center for Critical Thinking (Paul, 1993). He cautions against over-emphasizing any particular definition of critical thinking because "definitions of complex realities are at best aids to the beginnings of understanding ...scaffolding for the mind". With that in mind, he defines critical thinking as: Critical thinking is thinking about your thinking while you're thinking in order to make your thinking better. Two things are crucial: 1) critical thinking is not just thinking, but thinking which entails self-improvement and, 2) this improvement comes from skill in using standards by which one appropriately assess thinking. To put it briefly, it is self-improvement (in thinking) through standards (that assess thinking). It is disciplined, rational, self-directed thinking that skillfully pursues the purpose for thinking within some domain of knowledge or human concern. (Paul, 1993) . Paul et al. (1989) have given another detailed description of critical thinking by taking affective domain of mental processes into consideration. Their list composed of 35 strategies that a critical thinker possesses has been used widely in related research (Yıldırım 2010b; Yıldırım 2011; Sahinel, 2007). The list of these strategies is given in Table 1 Paul et al. (1989).

[Insert Table 1 about here]

These strategies are divided into two groups of mental structures: (1) affective strategies constituting traits of mind, and (2) cognitive strategies including proficient micro-skills and refined macro-skills. They assert that both domains are important and complementary to each other. Unmotivated persons or those who have not dispositions toward critical thinking can neither learn thinking critically nor think critically; thus, affective domain of persons should be emphasized as much as cognitive one. In addition, the affective strategies form bases of intellectual traits of mind that best, strong, and fair-minded thinkers possess. Nine essential intellectual virtues are mentioned: independence of mind, intellectual curiosity, intellectual courage, intellectual humility, intellectual empathy, intellectual integrity, intellectual perseverance, faith in reason, and fair-mindedness (Paul, 1991; Paul, Elder, 2006).

Description of Intellectual Traits

• Intellectual Humility: Having a consciousness of the limits of one's knowledge, including a sensitivity to circumstances in which one's native egocentrism is likely to function self-deceptively; sensitivity to bias, prejudice and limitations of one's viewpoint. Intellectual humility depends on recognizing that one should not claim more than one actually knows. It does not imply spinelessness or submissiveness. It implies the lack of intellectual pretentiousness, boastfulness, or conceit, combined with insight into the logical foundations, or lack of such foundations, of one's beliefs.

• Intellectual Courage: Having a consciousness of the need to face and fairly address ideas, beliefs or viewpoints toward which we have strong negative emotions and to which we have not given a serious hearing. This courage is connected with the recognition that ideas considered dangerous or absurd are sometimes rationally justified (in whole or in part) and that conclusions and beliefs inculcated in us are sometimes false or misleading. To determine for ourselves which is which, we must not passively and uncritically "accept" what we have "learned."

Intellectual courage comes into play here, because inevitably we will come to see some truth in some ideas considered dangerous and absurd, and distortion or falsity in some ideas strongly held in our social group. We need courage to be true to our own thinking in such circumstances. The penalties for non-conformity can be severe.

• Intellectual Empathy: Having a consciousness of the need to imaginatively put oneself in the place of others in order to genuinely understand them, which requires the consciousness of our egocentric tendency to identify truth with our immediate perceptions of long-standing thought or belief. This trait correlates with the ability to reconstruct accurately the viewpoints and reasoning of others and to reason from premises, assumptions, and ideas other than our own. This trait also correlates with the willingness to remember occasions when we were wrong in the past despite an intense conviction that we were right, and with the ability to imagine our being similarly deceived in a case-at-hand.

• Intellectual Integrity: Recognition of the need to be true to one's own thinking; to be consistent in the intellectual standards one applies; to hold one's self to the same rigorous standards of evidence and proof to which one holds one's antagonists; to practice what one advocates for others; and to honestly admit discrepancies and inconsistencies in one's own thought and action.

• Intellectual Perseverance: Having a consciousness of the need to use intellectual insights and truths in spite of difficulties, obstacles, and frustrations; firm adherence to rational principles despite the irrational opposition of others; a sense of the need to struggle with confusion and unsettled questions over an extended period of time to achieve deeper understanding or insight.

• Faith In Reason: Confidence that, in the long run, one's own higher interests and those of humankind at large will be best served by giving the freest play to reason, by encouraging people to come to their own conclusions by developing their own rational faculties; faith that, with proper encouragement and cultivation, people can learn to think for themselves, to form rational viewpoints, draw reasonable conclusions, think coherently and logically, persuade each other by reason and become reasonable persons, despite the deep-seated obstacles in the native character of the human mind and in society as we know it.

• Fairmindedness: Having a consciousness of the need to treat all viewpoints alike, without reference to one's own feelings or vested interests, or the feelings or vested interests of one's friends, community or nation; implies adherence to intellectual standards without reference to one's own advantage or the advantage of one's group. (Foundation for Critical Thinking 1996)

Paul and Elder (2006) also point out that critical thinkers routinely apply the intellectual standards (clarity, precision, accuracy, significance, relevance, completeness, logic, fairness, breadth, depth) to the elements of reasoning (purposes, inferences, questions, concepts, points of view, implications, information, assumptions) in order to develop intellectual traits leading to high quality thinking as demonstrated in Table 2 (Paul and Elder, 2006).

[Insert Table 2 about here]

Peter Facione and the APA Delphi Project. In 1988, the American Philosophical Association commissioned a national Delphi study to develop a consensus definition of critical thinking. Peter Facione was the principal investigator for the study, which involved 46 experts with recognized expertise in critical thinking, instruction, theory, and/or assessment. Half the panel members were from the field of philosophy and the other half from other disciplines (education, social sciences, and physical sciences). Using the Delphi technique, the panel provided their conceptualizations of critical thinking, which were compiled by Facione and provided to the panel for their feedback. This anonymous, iterative process was repeated over a two-year period until consensus was reached on the major components of critical thinking. (Facione, 1990). The definition and conceptualizations resulting from this study were subsequently validated and strongly endorsed in a replication study commissioned by the federal government at the Pennsylvania State University Center National Center on Post Secondary Teaching Learning and Assessment (Facione, 1998). Thus, the resulting conceptualization of generic (not discipline specific) critical thinking was based on the results of two intensive research studies.

The capsule definition of critical thinking derived from this study was ".. .the process of purposeful, self-regulated judgment giving reasoned consideration to evidence, contexts, conceptualizations, methods, & criteria" (Facione, 1998; Facione, 1990). The expert panel warned that not every valuable thinking skill was critical thinking, and that critical thinking was one among a family of closely related higher order thinking skills.

They emphasized that critical thinking was context dependent and that their definition and list of sub-concepts were not meant to be exhaustive, but rather to provide a set of cognitive skills and affective dispositions that were at the core of critical thinking. The panel further warned that for a person to be engaged in critical thinking did not mean that they had to exhibit every skill & disposition at all times. The developmental nature of gaining critical thinking skills and abilities was also addressed. (Facione, 1990).

The Delphi project resulted in a list of cognitive skills and dispositions that were agreed upon by the experts as core components of critical thinking (Facione, 1990). The thinking abilities used to think critically were called cognitive skills, while the "habits of the mind", individual attributes that made one more prone to use critical thinking skills in all aspects of their lives, were called dispositions (Facione, 1990). The panel agreed that having the skills without the disposition to use them, or vice versa, did not produce the kind of critical thinker desired as a result of an educational process. This conclusion was later supported by a national survey of employers, policymakers, and educators that included not only skills, but also the dispositional dimension of critical thinking as an essential outcome of college education (Jones, et all., 1995). The Delphi panel also agreed that critical thinking cognitive skills could be taught and the critical thinking dispositions fostered, advocating efforts to create learning environments conducive to teaching and promoting both critical thinking skills and dispositions in students. (Facione, 1990). The cognitive skills identified were: *analysis, evaluation, inference, interpretation, explanation,* and *self-regulation.* Consensus was very high on all six skills.

CRITICAL THINKING AND NURSING EDUCATION

Traditionally it has been assumed that emphasis within nursing education upon the nursing process, i.e. the scientific method applied to nursing practice, would lead to enhanced critical thinking ability as students progress through nursing education. As nursing students grow in the knowledge of the discipline within the classroom, encounter more acutely ill patients, increased technology, and complex ethical issues within the clinical setting, one would expect they would grow in skills of critical thinking. Although there has been a great deal of research to this end, a review of the nursing research literature on this topic indicates that this assumption has not been clearly supported (Adams, 1999; Kintgen-Andrews, 1991). This section will review this research.

Early integrative reviews of both longitudinal and cross-sectional studies of critical thinking growth in nursing students during nursing education reported mixed results **(**Beck et al., 1992; Hickman, 1993). These findings are supported by a more recent review. Adams (1999) summarized 20 studies conducted from 1977 to 1995 focusing on change in the critical thinking abilities of nursing students during baccalaureate education. Although some reported significant increases, others found no changes, while still others found significant declines. Adams concluded, "there is no consistent evidence that nursing education contributes to increasing the critical thinking abilities of nursing students". This perplexing finding is also reflected in studies of nursing students in other nursing educational programs, such as ADN, diploma, and RN-to-BSN. A finding of particular interest was that, when the influence of age was controlled, the critical thinking of 32 BSN nursing faculty was not significantly higher than 32 sophomore nursing students (Saarmann, et all., 1992).

Studies either omitted from, or published since, Adam's review continue to demonstrate this pattern of mixed results. Using the Watson-Glaser Critical Thinking Appraisal, Saucier (199S) conducted a longitudinal study on changes in the critical thinking of six groups of students, three years of entering classes of both BSN nursing students and RN-BSN completion students. With the exception of one class of BSN students, no significant differences in scores were found from start to completion of their program. In another longitudinal study of a sample of 203 BSN nursing students, Adams, Stover and Whitlow (1999) also found no increase in critical thinking abilities between the sophomore and senior years. This correlates with yet another longitudinal study by Vaughan-Wrobel, O'Sullivan and Smith (1997), who found no difference in the scores from entry to end of the junior and senior years for all three classes of students enrolled in a baccalaureate nursing program. They did, however, find a small but significant correlation between age and critical thinking. The older the students, the higher the critical thinking score. Also, critical thinking was higher for those having another educational degree at entry than for those who had none. Another interesting finding of this study was that students with previous nursing experience had significantly lower scores than those with no experience.

For over 25 years of research, the WGCTA has been the predominant tool used to measure critical thinking within nursing research. In her synthesis of studies of critical thinking in baccalaureate students, Adams (1999) reports that the WGCTA was used in 18 of 20 studies. However, as study after study reports "no significant difference," or even a decline in critical thinking skills, nurse researchers consistently question the use of the WGCTA as an appropriate instrument for measuring critical thinking in nursing.

This conclusion would seem to validate McMillan's (1987) warning that the WGCTA might have "sufficient technical limitations to significantly weaken research that uses this measure". Acknowledging problems with the WGCTA, more recent thought within the profession (Rane-Szostak, 1996) is that the complexity of critical thinking within nursing may be better represented by the consensus definition derived from the APA's Delphi study (1990). Therefore, many nursing studies have adopted the *California Critical Thinking Skills Test* (CCTST), the first instrument to derive its construct validity from the APA's definition.

Also derived from the APA's consensus definition of the "ideal critical thinker" is the *California Critical Thinking Disposition Inventory* (CCTDI). Developed by Facione, Facione and Sanchez (1994), this 75-item Likert-type instrument has items representing eight dispositional subscales identified by factor analysis. The resulting constructs are: *truth seeking, open mindedness, analyticity, systematicity, critical thinking, self-confidence, inquisitiveness, and cognitive maturity.* The authors claim this tool is the first objective means to measure the dispositional dimension of critical thinking. Although the APA's description of the "ideal critical thinker" was intended as a discipline neutral description, its definition has been recognized as a richly textured construct that could well serve the profession of nursing. Facione et al. (1994) suggest that the "ideal critical thinker" also defines a nurse who exercises outstanding clinical judgment. Therefore, this instrument has also gained widespread popularity within nursing research. To date, however, the results of research on the development of critical thinking during nursing education utilizing the CCTST continue to be mixed. In a cross-sectional study of beginning and ending baccalaureate nursing students, McCarthy, Schuster, Zehr and McDougal (1999) found that ending students had significantly higher critical thinking CCTST scores than beginning students. There were also differences between groups in the overall scores for the CCTDI. Yet in a similar study, Bower (1995) found no differences in the critical thinking of freshman, sophomore, junior and senior baccalaureate nursing students. However, Bower did find differences between age groups in several of the dispositions. The non-traditional student group (over 26 years of age) scored significantly higher than the traditional age group in *truth seeking, confidence, inquisitiveness* and *cognitive maturity.* Bower speculates that these differences are perhaps due to increased time in college, life, and work experience.

Facione et al. (1994) have suggested that critical thinking skills and critical thinking dispositions may be mutually reinforcing, with clusters of dispositions and skills acting in conceit as strengths in the thinking of certain disciplines. Acknowledging this possibility, Walsh and Hardy (1999) utilized the CCDTI to examine differences in the disposition towards critical thinking of college students across genders and majors within the disciplines of English, psychology, education, business, history and nursing. The highest disposition scores were found in the disciplines of English, psychology and nursing. However, no sets or clumps of dispositions were identified in a given discipline. Majors were then grouped as practice and non-practice disciplines. Those in the non-practice grouping had generally higher scores. In all disciplines, females had higher scores than males in *open-mindedness* and *maturity.*

CCTDI inventory was developed based on the results of The Delphi Report in which critical thinking and disposition toward critical thinking were conceptualized by a group of critical thinking experts (Facione, 1990). The original includes 75 items loaded on seven constructs. These are inquisitiveness, open-mindedness, systematicity, analyticity, truth-seeking, critical thinking self-confidence, and maturity. Briefly, the *inquisitiveness* construct including 10 items that measures one's intellectual curiosity and one's desire for learning without considering any profit. The *open-mindedness* construct contains 12 items that measures being tolerant of divergent views and sensitive to the possibility of one's own bias. The *systematicity* construct comprised of 11 items, and it measures how a person is organized, orderly, focused, and diligent in inquiry. The *analyticity* construct involving 11 items addresses the application of reasoning and the use of evidence to resolve problems. The *truth-seeking* construct including 12 items measures the disposition of being eager to seek the best knowledge in a given context, courageous about asking questions, and honest and objective about following inquiry. The *critical thinking self-confidence* construct consisting of 10 items measures the trust the soundness of one's own reasoning processes. Finally, the *maturity* construct involving 10 items measures cognitive maturity and the disposition to be judicious in one's decision-making (Facione,et all., 1995; Kökdemir, 2003).

Kökdemir (2003) carried out an adaptation study to transform this inventory into Turkish version because of cultural concerns. After all items were translated into Turkish by eight persons including six psychologists, a simultaneous translator and the researcher himself, it was administered to 913 students in the Faculty of Economic and Administrative Sciences.

Firstly, item-total score correlations were estimated and 19 items whose correlation under .20 was eliminated from the scale. Factor analysis was performed on the reduced scale. His study revealed that five items had lower factor loadings than .32 and items under open-mindedness and maturity constructs were loaded on one construct. Finally, 51 items with six constructs were kept in the scale Reliability of the whole scale was found .88. Reliability coefficients of each subscale ranged from .61 to .78.

Yıldırım (2010a) skill based critical thinking education program were conducted 14 week (two credit), 11 units, every unit theoretical knowledge, scenario studies, exercises and homework in the content of the elective course. Topics covered were committed to the nursing process. Skill based critical thinking education program were conducted firstly. There was not statically significant difference between students' pretest CCTDI scores ($p>0.05$) and there was statically significant difference between posttest CCTDI scores ($p<0.05$); it is seen that the discussing group had moderate level and control group had lover level scores. This difference originated from discussing group that had higher academic success scores from control group. It is observed that discussing group students had explicit increase on final grade success through the first unit to last unit in the course period.

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Table 1 : Strategy List: 35 Dimensions of Critical Thought

Affective Strategies
S.1. Thinking independently
S.2. Developing insight into egocentricity or sociocentricity
S.3. Exercising fairmindedness
S.4. Exploring thoughts underlying feelings and feelings underlying thoughts
S.5. Developing intellectual humility and suspending judgment
S.6. Developing intellectual courage
S.7. Developing intellectual good faith or integrity
S.8. Developing intellectual perseverance
S.9. Developing confidence in reason
Cognitive strategies-Macro Abilities
S.10. Refining generalizations and avoid oversimplifications
S.11. Comparing analogous situations: transfering insights to new contexts
S.12. Developing one's perspective: creating or exploring beliefs, arguments, or theories
S.13. Clarifying issues, conclusions, or beliefs
S.14. Clarifying and analyzing the meanings of words or phrases
S.15. Developing criteria for evaluation: clarifying values and standards
S.16. Evaluating the credibility of sources of information
S.17. Questioning deeply: raising and pursuing root or significant questions
S.18. Analyzing or evaluating arguments, interpretations, beliefs, or theories
S.19. Generating or assessing solutions
S.20. Analyzing or evaluating actions or policies
S.21. Reading critically: clarifying or critiquing texts
S.22. Listening critically: the art of silent dialogue
S.23. Making interdisciplinary connections
S.24. Practicing Socratic discussion: clarifying and questioning beliefs, theories, or perspectives
S.25. Reasoning dialogically: comparing perspectives, interpretations, or theories
S.26. Reasoning dialectically: evaluating perspectives, interpretations, or theories
Cognitive strategies-Micro Abilities
S.27. Comparing and contrasting ideals with actual practice
S.28. Thinking precisely about thinking: use critical vocabulary
S.29. Noting significant similarities and differences
S.30. Examining and evaluating assumptions
S.31. Distinguishing relevant from irrelevant facts
S.32. Making plausible inferences, predictions, or interpretations
S.33. Evaluating evidence and alleged facts
S.34. Recognizing contradictions
S.35. Exploring implications and consequences

Table 2. The Mental Process For Developing Intellectual Traits

The Standards	**The Elements**	**Intellectual Traits**
clarity	purposes	intellectual humility
precision	inferences	intellectual
accuracy	questions	perseverance
significance	concepts	intellectual autonomy
relevance	points of view	faith in reason
completeness	implications	intellectual integrity
logic	information	intellectual empathy
fairness	assumptions	intellectual courage
breadth		fair-mindedness
depth		