A Practical Coaching Model for Critical Thinking Skill and Leadership Development (C/CTSLD)

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Abstract

Critical thinking skills are a core competency needed by today's leaders. However, a deficiency in critical thinking skills in the workplace has been well documented, and research has shown dire consequences for the individual and the organization. This paper espouses a practical coaching model for improving critical thinking skills and facilitating leadership development. Using a solution-focused approach with the six critical thinking skills as identified by the APA Delphi Research Report, its iterative nature fosters the formation of "habits of mind". Using coaching (questioning) techniques on the first four skills, qualitative (interview) data was gathered from new entrants into the workforce. Improvements in their critical thinking skills were measured using quantitative data (pre, mid and post) gathered from the California Critical Thinking Skills Test. Results showed improvements in critical thinking skills for almost all participants (future leaders). These findings support the value and use of coaching and critical thinking skill development in management/leadership development programs, or any program focused on personal and/or professional development. Future research warrants the use of an extended coaching schedule (for individual and group participation) and the inclusion of the last two skills. In addition, the use of a larger research sample and follow-up testing/evaluation for a year to validate the formation of "habits of mind" is needed.

Keywords: *critical thinking; coaching; leadership development; solution-focused coaching; coaching psychology; habits of mind; California Critical Thinking Skills Test*

1. Introduction

Critical thinking consists of a set of skills and competencies, and encompasses an individual's "ability to make decisions by analyzing issues and evaluating options, recognizing the existence of assumptions and the need to make inferences" (Walker & Diaz, 2003, p. 64). A report by The Conference Board (2006) highlights the value of critical thinking skills for new entrants to the workforce. However, research confirms the existence of a critical thinking deficiency. The problem has been studied extensively and not only does it exists, but students' critical thinking skills in higher education have shown minimum improvement over the years (Tsui, 2008; Flores, Matkin, Burbach, Quinn & Harding, 2012). Flores, et al. (2012) highlight the fact that this deficiency carries over into the workplace, a position that is supported by an earlier report by the Robert Wood Johnson Foundation (2006), which showed the value of critical thinking to workforce efficiency.

A skill deficiency has had and will continue to have dire consequences for the workforce. More importantly, a lack of critical thinking skills translates into an inability to lead (and become future leaders) (Flores, et al., 2012). The problem has already manifested itself in the workplace because most leaders lack strong critical thinking skills (Rooke & Torbert, 2005). Examples of this as identified in the California Critical Thinking Skills Test (CCTST) User Manual (Insight Assessment, 2015) are seen in "dangerous and costly errors, repeated mistakes, bad decisions, failed systems, inaction when action is needed, the giving of bad advice, inaccurate assumptions, and the lack of anticipated action" (p. 9). In essence, if future leaders lack these skills, they will be less effective and their mistakes could have severe consequences for the future of the organization (Carroll & Mui, 2008; Spreier, Fontaine & Malloy, 2006). On the other hand, not only does excellent leadership move the firm forward, it enables the organization to make meaningful contributions to the global economy (Flores, et al., 2012). Thus, the research question presented here is "Can coaching improve critical thinking skills (and facilitate leadership development)?"

2. Literature Review

2.1 Leadership Development

Leadership is an elusive concept that has different meaning in different environments. However, most organizations describe it as a set of skills and competencies needed in a given situation or level in the organization to ensure individual and organizational success. Mumford, Campion, and Morgeson (2007) divided leadership skills into four categories: cognitive, interpersonal, business and strategic, with cognitive as the most important. Cognitive skills are mental skills (reasoning, perception, and intuition) used to acquire new knowledge and new ways of solving problems. They serve the vital function of processing thought, and deficiencies in this area create challenges in an individual's ability to effectively lead (Flores, et al., 2012). Thus, the goal of "leadership development" is to instill in current and future leaders the skills and competencies needed to be successful, and of upmost importance are critical thinking skills.

2.2 Critical Thinking (CT) Perspectives

Early research by Dewey (1933) highlighted the importance of having a critical thinking mindset ("habits of mind") for solving personal and professional problems. Since then, varying views have been espoused in describing critical thinking. Weinstein (1995) adds that critical thinking fosters a higher level of reasoning and comprehension. In addition, the critical thinking challenges presuppositions and enlarges the range of possible solutions to problems. Thus, critical thinking and creativity (in finding alternatives) are complementary concepts.

More recently, Ticuşan and Elena (2015) define critical thinking as "a way of approaching and solving problems based on convincing, logical and rational arguments, which involve verifying, evaluating and choosing the right response for a given task and reasoned rejection of the other alternative solutions" (p. 309). Critical thinking is also an active, coordinated, complex process involving thought processes. Fundamental is the interaction of positive and negative information to determine its truth value, and the further processing of this information to generate new ideas. Jiang and Yang (2015) conclude that "employees with strong critical thinking ability can identify problems from complicated situations, gather relevant information, and create alternative solutions" (p. 1228). In addition, they are better equipped to deal with large amounts of information which leads them to more and better ideas drawn from varying viewpoints.

Although there are varying perspectives on critical thinking, there are key aspects that can provide a functional view. Flores and Matkin (2012) propose that the key elements are "skills, rationality, openness to alternative viewpoints, suspension of prior constructions, introspective reflection, and non-egocentric processing (p. 5), with reflection being critical to the process (Grossman, 2009; Lizzio & Wilson, 2007). Thus, critical thinking involves using prior beliefs to process new information (Papastephanou & Angeli, 2007; West, Toplak & Stanovich, 2008), while thinking logically, even when logic and our beliefs differ (West, et al., 2008). Another commonality is "an ability to use reason to move beyond the acquisition of facts to uncover deep meaning" (Weissberg, 2013, p. 318).

2.3 Consensus Definition of Critical Thinking

In 1987 the American Psychological Association [APA] sought to formulate a consensus definition by commissioning what turned into a two-year research project spearheaded by Peter Facione. Using a Delphi approach with an international panel of forty-six men and women experts from various disciplines from the United States and Canada, the world famous study is now called the APA Delphi Research Report (The American Philosophical Association, 1990). The resulting report not only defined critical thinking, it identified and described its core critical thinking skills and subskills. The document is still being used today to aid in the understanding of critical thinking theory. In addition, the Report's recommendations have been invaluable for critical thinking instruction and assessment.

The definition of critical thinking according to the APA Delphi Research Report (The American Philosophical Association, 1990) offered a definition of critical thinking as the "… purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based" (p. 27). According to Section 8 of the California Critical Thinking Skills Test [CCTST] User Manual, the six core critical thinking skills are:

1. Interpretation: To comprehend and express the meaning or significance of a wide variety of experiences, situations, data, events, judgments, conventions, beliefs, rules, procedures or criteria.

2. Analysis: To identify the intended and actual inferential relationships among statements, questions, concepts, descriptions or other forms of representation intended to express beliefs, judgments, experiences, reasons, information, or opinions.

3. Evaluation: To assess the credibility of statements or other representations which are accounts or descriptions of a person's perception, experience, situation, judgment, belief, or opinion; and to assess the logical strength of the actual or intended inferential relationships among statements, descriptions, questions or other forms of representation.

4. Inference: To identify and secure elements needed to draw reasonable conclusions; to form conjectures and hypotheses; to consider relevant information and to educe the consequences flowing from data, statements, principles, evidence, judgments, beliefs, opinions, concepts, descriptions, questions, or other forms of representation.

5. Explanation: To state the results of one's reasoning; to justify that reasoning in terms of the evidential, conceptual, methodological, criteriological and contextual considerations upon which one's results were based; and to present one's reasoning in the form of cogent arguments.

6. Self-regulation: Self-consciously to monitor one's cognitive activities, the elements used in those activities, and the results educed, particularly by applying skills in analysis and evaluation to one's own inferential judgments with a view toward questioning, confirming, validating, or correcting either one's reasoning or one's results (p. 73).

2.4 Coaching Defined

Coaching developed from a multitude of disciplines, including philosophy, sociology, anthropology, sports, communication science and even natural sciences (Brock, 2008). It has been described as a professional collaborative relationship between a coach and coachee (O'Broin & Palmer, 2009). However, its true value is as a positive intervention whereby the coach facilitates an experiential learning process (Biswas-Diener, 2009) for performance improvement in both the personal and professional lives of individuals (Davison & Gasiorowski, 2006) to help develop their attitudes and skills (Whitworth, Kimsey-House, & Sandahl, 1998). Grant (2003) provides a more general definition of coaching as a "result-oriented, systematic process in which the coach facilitates the enhancement of life experience and goal-attainment in the personal and/or professional life of normal, non-clinical clients" (p. 254). In essence, it helps people find "real-life solutions to real-life problems" (Grant, 2013, p. 36). When conducted by a professional, coaching has been shown to be an effective intervention for employee performance improvement and to have a positive effect on psychological variables, i.e., self-regulation, self-insight and solution-focused thinking (Theeboom, Beersma & van Vienen, 2013) and thus it facilitates organizational effectiveness (Grant, 2003).

Empowering others by unlocking their potential is a key coaching activity with a key premise being that every individual has the potential for growth (Biswas-Diener, 2009). Thus, the ultimate aim is to bring about deep-level changes and learning (de Haan, Culpin & Curd, 2011). Coaching is accomplished by asking powerful probing questions, while allowing the person to think and formulate an answer/response. If stuck, the coach can offer guidance but only by way of follow-up questions (scaffolding). The general consensus is that the more questions posed (and answered), the deeper the learning (Wiersema & Licklider, 2009). Another common aspect of coaching is the coach's ability to actively listen, use cognitive tools, and hold the individual accountable by assigning homework (Biswas-Diener, 2009).

As discussed by Wiersema and Licklider (2009), the focus is on metacognitive awareness of thinking, and it is this metacognition process of "thinking about one's own thinking" (p. 123) that causes learning to occur. Of paramount importance is a process of self-reflection (Wiersema & Licklider, 2009; Robinson & Gahagan, 2010; Flores, et al., 2012) where individuals broaden their perspective (making it different and better) by removing personal "biases, beliefs and assumptions" (Wiersema & Licklider, 2009, p. 119). Theeboom et al., (2013) take an even stronger position espousing that individuals must have opportunities for critical reflection and experimentation in order to insure that deeper learning takes place.

2.5 Coaching and Psychology

A trend in the coaching profession is the blending of coaching with psychology, i.e., cognitive, behavioral and solution-focused therapies (Biswas-Diener, 2009). Thus forms the field of coaching psychology with its focus on behavior, cognition, and emotion (Passmore, 2010). The basic premise is that all coaching requires the use of the brain and the goal is to get the brain to change the way it thinks (Grant, 2015). In essence, we "coach the brain"

(Grant 2015, p. 24).

A solution-focused approach to coaching focuses on finding solutions (versus analyzing problems from the past) and is well-established in the field of psychology (Grant, 2015). It has been shown to bring about cognitive and behavioral changes, and aid in the achievement of goals (Grant, 2003; Mackie, 2014). The process relies on the individual's resilience, strengths and resources and uses them to identify ways to achieve goals and bring about positive change (Grant, 2011). Solution-focused principles as compiled by Grant (2013) include:

- A focus on solutions (formation of solutions versus the problem)

- An assumption that positive change will occur (an expectation that the client will engage in change-relative behavior)

- The use of a collaborative working alliance (coach and client are equals)

- Changing the viewing to change the doing (taking a different perspective)

- Being pragmatic and flexible (focus on what works) (p. 37).

There is empirical evidence to support the use of a solution-focused approach in various coaching areas, i.e., personal, organizational, executive and sports (Bell, Skinner & Fisher, 2009; Grant, 2003; Jackson & McKergow, 2002; Szabo & Meier, 2009). In actually, coaching employs both problem-focused and solution-focused approaches. However, research shows that although both bring about change, the latter is more effective (Grant, 2012). As in other approaches to coaching, effective questioning is critical to the process (McKergow & Korman, 2009) and raises awareness so that individuals can create their own actionable solutions (Grant, 2013).

3. The Coaching Model

Coaching for Critical Thinking Skill and Leadership Development [C/CTSLD] is a skill-building model that utilizes a number of concepts (listening, silence, questioning, and scaffolding) and borrows from a myriad of theories (experiential learning, collaborative learning, transformation learning, self-discovery, adult learning, reflective judgment and learning, active learning, personal construct theory, reconstruction, reflective observation) all of which prove invaluable to its formation and operation.
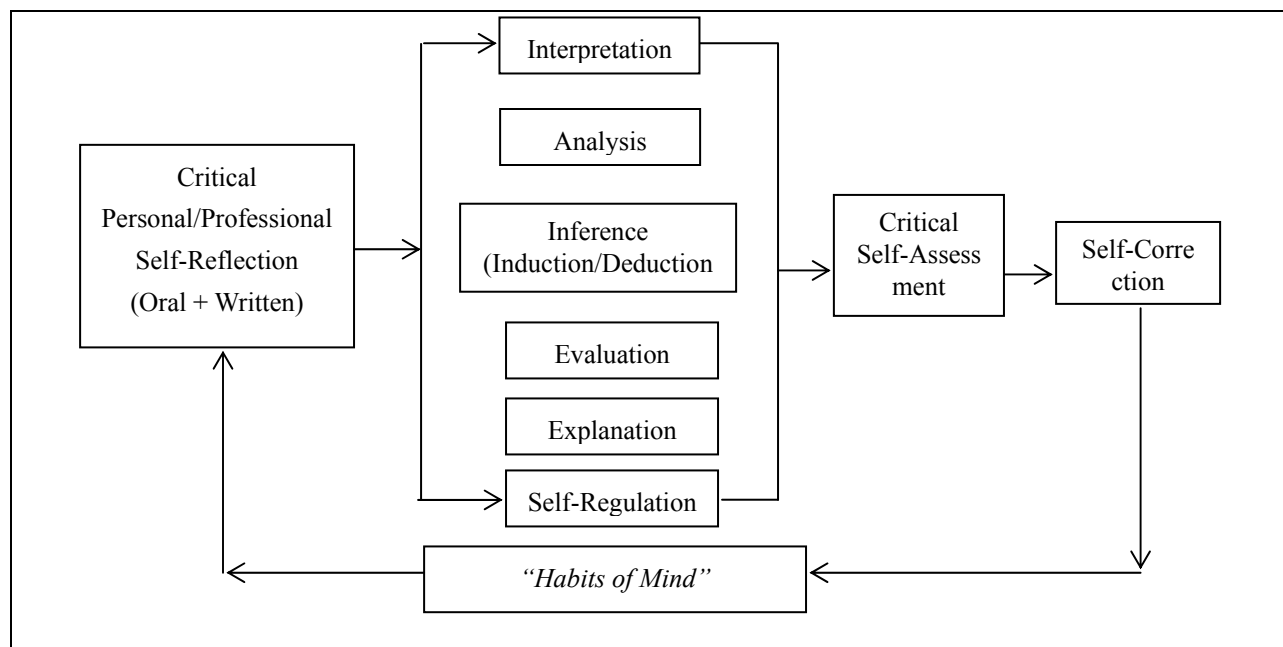

Figure 1. Coaching for Critical Thinking Skill and Leadership Development Model

Figure 1 shows the CCTS/LD Model which starts with oral and written critical self-reflection on each of the critical thinking skill area, followed by critical self-assessment and self-correction. It is a continuous process which should result in the formation of "habits of mind". For a detailed explanation of each area:

A. Critical Self-Reflection – deep thought on significant past personal and professional experiences; chronicled by journaling (written) and narration (using "talk aloud"/"think aloud" approach). A coach poses thought-provoking questions (and follow-up questions) while using listening and silence as tools for thinking and reflecting.

B. Critical Thinking Skills – in a group format, develop content knowledge on each of the six CT skills, sub-skills and examples using various instructional methods; followed by their application via assignments, guided instruction and practice.

C. Critical Self-Assessment – deep, honest self-evaluation of our experiences (including thought process, biases, beliefs, assumptions, attitudes and perspectives) and our subsequent actions and behaviors.

D. Self-Correction – Applying results of Self-Assessment to reconstruct/reinvent ourselves and our thinking; revision of persona theories and paradigm shifts; regulate future thoughts, actions and behaviors.

E. Habits of Mind – continuously repeating the process via self-coaching (questioning ourselves) relative to new and old experiences; using systematic inquiry that results in intentional, habitual, deep and logical thinking; a subconscious mind.

4. Research Methodology

This research project took place during the Fall 2014 semester and included both qualitative (coaching) and quantitative (testing) data. It covered a ten (10) week period (with a maximum six weeks of coaching). The CCTST was administered at the start of the process (Pre-test) to provide a baseline measurement for each participant. The next four weeks consisted of one-on-one/in-person solution-focused coaching sessions (one skill per week) that lasted from 30-60 minutes. In the 6th week the test was administered again (Mid-test) and results compared with the baseline. All participants were given the option to continue receiving two additional weeks of coaching (covering the same four skills but with more depth) and/or continue reviewing the skills on their own. In week nine, the test was administered for a third time (Post-test), and in week ten participants were debriefed and given their results. For comparison purposes, the higher of the Mid-test and Post-test scores were used to indicate improvement.

Table 1. Research Schedule

Week 1	Weeks 2 - 5	Week 6	Weeks 7 - 8	Week 9	Week 10
Pre-test	Coaching	Mid-test	Additional Coaching/ Skill Review	Post-test	Debrief

Table 1 shows the research schedule which covering a ten-week period. It includes testing, coaching and study of each critical thinking skill.

4.1 Participant Selection

Once the Institutional Review Board application and online version of the assessment were approved, volunteers were solicited from students in the Jackson State University College of Business (and the author's Strategic Management class). No incentives were given for their participation. From the students who volunteered, twelve seniors (six males and six females) were chosen due to their perceived "coachability", personality traits and motivation, for improving their critical thinking and leadership skills. (Giacobbi, 2000). They were all in the early stages of their careers (working either full or part-time). The group was narrowed down based on having scored at least a 13 'Overall' score on the CCTST Pre-test. Therefore, the final research group consisted of nine individuals (coachees) (three females and six males), ranging in age from 21 - 29.

4.2 Qualitative Research

After the Pre-test, students received a handout explaining each of the six core critical thinking skills and subskills. The handout can be found in Section 8 of the CCTST User Manual by Insight Assessment. However, the actual six core skills and their descriptions were taken from the APA Delphi Research Report (The American Philosophical Association, 1990). This research project focused on the first four skill areas (Interpretation, Analysis, Evaluation and Inference), with Inductive and Deductive Reasoning incorporated into Inference. In addition, the latter two skills (Explanation and Self-Regulation) were infused within the first four (i.e., each week participants were required to explain and self-regulate their actions).

Table 2. Coaching Assignments

Weeks	Core Skill	Assignments
2	Interpretation: Situation	1. Describe in detail a very important situation that you experience. 2. How did you interpret it? 3. How did you handle it?
3	Analysis: Problem	1. Describe in detail a very important problem that you faced. 2. Analyze the problem step-by-step. 3. How did you solve the problem?
4	Evaluation: Argument	1. Describe in detail (both sides) a serious argument that you had. 2. What were your reasons for being for and against each position? 3. How did the argument end?
5	Inference: Conclusion	1. Explain a conclusion you drew from a previous (or new) assignment. 2. What was your thought process, assumptions, options? 3. What were the facts to support your conclusion? What are the chances that you are right? Wrong?
	Skills 1 - 4	4. Apply questions. 5. What did you learn?

Table 2 identifies the coachees' assignments for weeks 2-5 and covers each of the first four skill areas.

Coachees were asked to study each of the critical thinking skill areas and complete an assignment prior to each coaching session. In developing the assignments, each skill was converted into an easily recognizable "experience" to reflect on, such as a "Situation", "Problem", "Argument", and "Conclusion". Each weekly assignment called for critical self-reflection (revisiting the past), journaling (written documentation) and narration (talking) about real-life experiences. Although the past (which was often problematic) served as a foundation for the coaching process, the goal was to find more rational and logical solutions that could be applied to future "experiences". In adhering to a standardized open-ended interview format, coachees answered five core questions (developed by the coach) and a set of reflective questions (taken from the "Question Asking Skills: A Leadership Training Tool" as found in the CCTST User Manual). Questions #1, #2, and #3 were specific to the particular skill, whereas questions #4 and #5 were general in nature and applicable to all skills. The former allowed them to revisit a previous significant life "experience". The latter allowed for reflection on what they did versus what they probably should have done and/or will do in the future. This information served as the basis for their one-on-one coaching sessions. During the sessions, notes were taken for further analysis.

To get coachees talking, a "think aloud" interviewing technique (as described by Facione & Facione, 2007) was used. It mandates that the coach be nonjudgmental throughout the process and limits the amount of prompting. Discussions were not limited to the assignments, however. Asking follow-up questions (scaffolding) allowed for a deeper exploration of the various topics that were uncovered. At the end of the process, honest self-assessment allowed for better thinking and decision making around future life experiences.

Table 3. Critical Thinking Skill Questions

Critical Thinking Skills	Examples of Reflective Questions
Interpretation	What exactly is happening? What is the best way to characterize/categorize/classify this?
Analysis	Why do you think that? What are the arguments pro and con?
Evaluation	How strong are those arguments? Do we have all our facts right?
Inference	Given what we know so far, what can we rule out? What are some alternatives we haven't yet explored?

Adapted with permission from © 2014 User Manual for the CCTST, published by Insight Assessment.

As identified in Table 3, reflective questions were provided on each of the four critical thinking skill areas.

4.3 Quantitative Research

The CCTST is an internationally recognized critical thinking skill assessment of an individual's reflective thinking. The generic form of the test was chosen as the measurement tool for this research and use approval was granted by Insight Assessment via a one-year license. This version measured Analysis, Inference, Evaluation, Induction and Deduction. Content, construct and criterion validity have been confirmed using standard psychometric item analysis methods and item-specific protocol analyses. In addition, test retest reliability has been established. A Scale score was provided for each skill area per coachee, in addition to their Overall score (34-point) and a Percentile ranking (based on results for similar test-takers). The strength of the Overall score is further grouped as: (1) Superior: 24 or higher; (2) Strong: 19 – 23; (3) Moderate: 13 – 18; (4) Weak: 8 – 12; and (5) Not Manifested: 0 – 7. For purposes of this research, the Overall and Percentile rankings were used.

5. Results

Given the research in support of questioning techniques like coaching as a developmental tool, it was anticipated that critical thinking skills would improve. However, the magnitude of the improvements given the short timeframe was unexpected. In response to the research question, the results confirm that coaching can be used to improve critical thinking skills (and thus for leadership development).

5.1 Qualitative Research Findings

Coaching sessions focused on each of the core critical thinking skills (Interpretation/situation, Analysis/problem, Evaluation/argument, Inference/conclusion). Each coachee gave varying amounts of time and energy to the process. In addition, each came from a different place; yet their outcomes were similar (i.e., a paradigm shift). The following is a synopsis of each coachee (based on notes taken during the sessions).

Table 4. Synopsis of Coaching Sessions

Case #1	*A 21 year old male business administration major with a 3.87 overall GPA.* With limited writing but a lot of reflection, he was able to thoroughly explain the "experience" and articulate logical answers to questions. He demonstrated a very clear and analytical thought process with each of the assignments and recognized the importance of research prior to a response. Thus, his analyses, evaluations, interpretations, and inferences were all grounded in facts. In applying the questions, prior responses to the "experiences" were proven to be best. In the end, the process confirmed the quality of his skills.
Case #2	*A 29 year old female accounting major with a 3.98 overall GPA.* She came to each session well prepared, but with strong positions. Each assignment involved extensive reflection and writing, and her "experiences" dealt with significant family and coworker issues. However, she always took the position that they were wrong and she was right. In our discussions, emotions were high. The idea that her prior responses were flawed was difficult for her to accept. In some cases, she even refused to engage in the discussion and/or answer the follow-up questions. In the end, she recognized the flaws in her thinking, and even made an effort to revisit and correct some of her past responses.
Case #3	*A 21 year old female finance major with a 3.4 overall GPA.* She came to each session with extensive reflection and writing. However, as a strong willed individual she was convinced that her positions and logic were correct. Her "experiences" involved significant health, family and friend issues. However, in her responses to those "experiences", she was right and they were wrong, even her parents. Our discussions were robust, but in her effort to improve she did not allow her emotions to interfere with the progress that she hoped to achieve. She willingly revisited the "experiences" from a different perspective. In the end, she re-established relationships with family and friends, and offered apologies.
Case #4	*A 22 year old male accounting major with a 3.6 overall GPA.* He is a laid back and private individual who was confident that he had a superior thought process. As a result, he did not devote a lot of time to the assignments (reflection or writing), and the "experiences" that he shared were minor and lacked depth. With much effort, he finally recognized the flaws. His reflections and writing remained weak, but he put extra effort into studying the various skill areas and the studying paid off. In the end, he became more thoughtful, and took on a different perspective.
Case #5	*A 22 year old male business administration major with a 3.0 overall GPA.* He was laid back, quiet, and lacked confidence. He completed assignments with limited reflection and writing, and his

"experiences" were insignificant (but had value). After a few weeks, he realized the flaws in his thinking. More importantly, he saw that his poor decisions were costing him time, money and energy. He chose to continue with two additional weeks of coaching and study. As a result, his skills and confidence improved, and he started applying his learning to other areas for the benefit of others.

Case #6	*A 21 year old male accounting major with a 3.5 overall GPA.* Surrounded by professionals, he understood the value of good decision making. Thus, he devoted time to each assignment (writing and reflection), and was eager to engage in each discussion. His "experiences" were insignificant (but had value). With work, he recognized the flaws in his thinking, and became more determined than ever to improve. He chose to continue the coaching and study. In the end, his critical thinking skills and decision making had greatly improved, and he was extremely appreciative for the learning opportunity.
Case #7	*A 24 year old male finance major with a 2.1 overall GPA.* Smart but with a low GPA, he came to the process understanding that he needed something 'extra' to improve his chances of getting a good job. He completed the assignments with good reflection and writing. Although his "experiences" were insignificant, they still allowed for an examination of this thought process. It took a while but he was eventually able to identify the flaws on his own. He chose to continue coaching and study. In the end, his skills had improved and he continued to assess his everyday "experiences" but in a different way.
Case #8	*A 24 year old male accounting major with a 2.5 overall GPA.* A quiet individual who was eager to participate in the process for its potential value in his current job. Time did not allow for extensive reflection and writing but he came with good "experiences" that allowed for learning. Through our discussions, he immediately recognized the flaws in his thinking and immediately applied what he learned to his job. Even though the scores did not reflect it, his confidence, new perspective and recognition by his boss (promotion and raise) was a testimony to the improvements that he had made.
Case #9	*A 28 year old female business administration major with 3.1 overall GPA.* A quiet, private and mature individual, she came to the process with strong convictions that had developed over many years. Time did not allow for much reflection or writing, and her "experiences" were weak. With much effort and to her surprise, discussions identified flaws in her decision making process. The more we talked, the more she realized that much of her thinking was illogical and lacked a factual basis. In the end, she was started applying these new skills to her relationship with her family and coworkers.

Table 4 gives demographics for each coachee and provides an overview of their coaching experience.

5.2 Quantitative Research Findings

The following are the scores (Overall and Percentile) for each of the nine coachees at the Pre, Mid and Post point. As a summary, in comparison to their Pre-test (baseline), Overall and Percentile scores, seven of the nine coachees showed an increase in their critical thinking skills. More specifically,

- Five of the nine showed an increase by week 6 (Mid).
- The remaining two showed an increase by week 9 (Post).
- One who showed an increase by week 6 (Mid) showed an additional increase by week 9 (Post).

As to the strength of the Overall scores, the findings were also significant. Of those showing improvement (comparing the baseline to the highest point), five (#2, #4, #5, #6, #7) went from Moderate to Strong.

Table 5. Results from CCTST

Participant	Pre-Test		Mid-Test		Post-Test	
	Overall	Percentile	Overall	Percentile	Overall	Percentile
1	26	94	**27 (+1)**	**95 (+1)**	NA	NA
2	16	47	**20 (+4)**	**72 (+25)**	NA	NA
3	15	39	**18 (+3)**	**60 (+21)**	NA	NA
4	17	53	**19 (+2)**	**66 (+13)**	NA	NA
5	13	26	**16 (+3)**	**47 (+21)**	**19 (+3)**	**66 (+19)**
6	18	60	18 (n/c)	60 (n/c)	**20 (+2)**	**72 (+12)**
7	18	60	18 (n/c)	60 (n/c)	**19 (+1)**	**66 (+6)**
8	*13*	*26*	*11 (-2)*	*14 (-12)*	*11 (-2)*	*14 (-12)*
9	*14*	*33*	*12 (-2)*	*19 (-14)*	*11 (-3)*	*14 (-19)*

Using the CCTST, Table 5 provides the overall scores (and changes) and percentile ranking for each participant at the pre, mid, and post period.

6. Discussion

Results show that coaching can improve critical thinking skills, thus facilitating the development of future leaders. In observation of the qualitative and quantitative data:

- Participant #1 is a rare individual scoring in the 94th Percentile on the Pre-test (yet moving to the 95th Percentile by the Mid-point). This ranking was validated during the sessions by the logic, thoroughness, and analytical thinking involved in the responses.

- Participants #2 and #3 showed a sincere determination to improve their skills by sharing highly personal and significant life "experiences" (like major issues involving family and friends), engaging in extensive journaling and deep reflection, and spending time studying each skill area. During the self-assessment phase, they recognized flaws in their thought process and took steps to improve (self-correction), resulting in an increase in their Percentile scores from 47 to 72 (#2) and 39 to 60 (#3) by the Mid-point.

- Participants #4, #5, #6, and #7 viewed the process with interest but less excitement, using more general "experiences" and minimal journaling. Additional time was dedicated to studying the skill areas, and during the self-assessment phase, flaws were recognized and corrections made, resulting in a movement of the Percentile scores from the Pre-test to the Mid-point or Post-point from 53 to 66 (#4), 26 to 66 (#5), 60 to 72 (#6) and 60 to 66 (#7).

Interestingly, although tests results did not show an increase for all participants, self-assessments, supported by their testimonials, indicated that the process was beneficial and they saw improvements in their critical thinking skills.

- *"Coaching was truly invaluable and will help me handle situations for the rest of my life. I was challenged in my thought and pushed to be a better thinker." #1*

- *"With coaching I have a new outlook on life. Not only am I a better critical thinker, I make more positive decisions, which not only helps me but others as well." #2*

- *"Completing the critical thinking coaching sessions has helped me make better decisions. I am now able to properly think about all options, facts, and sides of an argument." #3*

- *"With this process, I felt challenged to improve. I truly saw positive changes in my mindset and the learning will be beneficial to me as I continue to improve my thinking." #6*

- *"I credit this training for getting a promotion to shift lead! My boss said over the last couple of weeks I have improved on thinking things through."#8*

Given their Percentile results, a developmental plan for this group would include:

- Participant #1 (95) should be encouraged to continue using their critical thinking skills, given challenging assignments, and immediately targeted for a leadership position.

- Participants #2 (72) and #6 (72) should be encouraged to continue using their critical thinking skills and given challenging assignments in preparation for future leadership opportunities.

- Participants #3 (60), #4 (66), #5 (66), and #7 (66) should be encouraged to continue using their critical thinking skills and given challenging assignments, with continuous assistance from a coach prior to leadership consideration.

7. Recommendations for Using Model

7.1 Fundamentals

For success in using the C/CTSLD model for critical thinking skill and leadership development,

- Individual coaching sessions (minimum 1 hour for at least four weeks) with extensive talking, journaling, critical self-reflection and self-correction focused on significant personal and professional life "experiences".

- To reinforce gains, there should be continuous coaching, opportunities for applying the skills (deliberate practice) and iterations of the model for the formation of Dewey's "habits of mind".

- To assess improvements, follow-up evaluation/testing on the critical thinking skills.

Embedded within the process is the expertise of the coach and the coachee's personal commitment to improving their critical thinking and leadership development skills.

7.2 Expansion of the Coaching Schedule

Based on observation and evaluation, it is also recommended that the schedule be modified to allow more coaching time for individuals and groups, and take into consideration the last two core critical thinking skills. The extended C/CTSLD schedule covers a four (4) month period with three (3) months devoted to critical thinking skills (group and individual activities). Two weeks are allocated for each of the six skills and each session last at least 1 hour. During designated weeks, the definition and examples of the skills and subskills are discussed in a group format; while one-on-one individual coaching on relevant assignments takes place on alternate weeks.

Table 6. Expanded C/CTSLD Schedule

	Weeks 1, 3, 5, 7	Week 9	Weeks 10, 12	Week 14	Week 15	Week 16
Pre-Test Handout	Group Discussion Skills 1 - 4	Mid-Test	Group Discussion Skills 5 - 6	Wrap-up	Post-Test	Debrief
	Weeks 2, 4, 6, 8		Weeks 11, 13			
	Individual Coaching Skills 1 - 4		Individual Coaching Skills 5 - 6			

Table 6 provides a revised coaching schedule, which includes all 6 skill areas, and covers a sixteen week period, with both individual and group coaching sessions.

Table 7. Additional Assignments

Weeks	Core Skill	Assignments
10-11	Explanation: Justification	1. Describe in detail a very important action or behavior. 2. What were your considerations and arguments? 3. How did you justify your decision?
12-13	Self-Regulation: Correction	1. Describe in detail an experience where you modified your action or behavior. 2. What was your thought process or reasoning? 3. What changes did you make or should you have made as a result thereof?

Table 7 adds assignments for the two additional skill areas, and covers weeks 10-13.

Table 8. Additional Critical Thinking Skill Questions

Critical Thinking Skills	Examples of Reflective Questions
Explanation	1. Can you tell us how you conducted that analysis? 2. Why do you think that (was the right answer/was the solution)?#
Self-Regulation	1. How good is your evidence?# 2. How good was your methodology, and how well did you follow it?#

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Table 8 adds the corresponding reflective questions for the two addition skill areas (covering weeks 10-13).

8. Conclusions, Limitations and Future Research

Critical thinking has been documented as a core leadership development competency. However, employees come to the workplace lacking critical thinking skills. The long-term effect of this deficiency to the employee can be measured both by a lack of promotional opportunities and future salary increases. More importantly, the effect on the U.S. workplace has been and will continue to be problematic. Therefore, employers must implement programs that will help employees overcome this deficiency. In essence, implementing the C/CTSLD Model can have positive outcomes for the employee, the employer and the U.S. workplace as a whole, and thus is worth considering.

The C/CTSLD Model would be ideal for incorporation into a company's management development program. Another application could be for leadership development programs like those sponsored by the U.S. Chamber of Commerce, The Conference Board, Center for Creative Leadership and the National Urban Fellows. Taking a larger

societal view, the model could be adapted for use with at-risk youths and first-time offenders to improve their thinking and decision making processes. Of note, it is highly recommended that an assessment tool be used to measure improvements and confirm the need for additional support.

Critical thinking skills are vital for the success of every employee, however, using the C/CTSLD Model in large organizations may be cost prohibited. Although it requires employee and employer time, online technology (Skype for individual sessions, WebEx and GoToMeeting for group sessions) can be used to reduce the costs. In addition, it requires the use of a professional coach and/or a manager with expertise in critical thinking content knowledge and solution-focused coaching techniques. However, with training and commitment, managers can learn and successfully apply both. In addition, a workbook has been developed for use by a coach (or trained manager), and the possibility exists for developing a web-based version. For leadership development, the model could be applied 'as is' once a Pre-test is administered and a minimum score is established (to select high potential individuals, i.e., future leaders).

Typically small sample sizes are suitable for qualitative research but the strength of this model would be further validated using a larger sample. In addition, "habits of mind" could not be established due to the short evaluation period. Ideally, a longitudinal study is needed that will allow for periodic testing/evaluation for skill improvement for at least a year. The initial coaching schedule focused on the first four skills. The inclusion of the last two skills may have resulted in even greater improvements. Therefore, future research warrants the use of an expanded coaching schedule (for individual and group participation) and the inclusion of the last two skills. In addition, the use of a larger research sample and follow-up testing/evaluation for a year to validate the formation of "habits of mind" is needed.

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