DIALOGUE AS MEDIUM (AND MESSAGE) FOR TRAINING CRITICAL THINKING[1]

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Abstract

Standard *internalist* approaches to critical thinking insist that critical thinkers maintain conscious, deliberate access to the reasons for their beliefs and actions. A more useful approach is *externalist*, focusing on the reliability of different types of processes for generating beliefs and decisions under different circumstances.

We describe an externalist approach to critical thinking based on dialogue. According to the theory, critical thinking is *asking and answering questions about alternative possibilities in order to achieve some objective*. Three perspectives are coordinated (by different individuals or inside a single head): a proponent, an opponent, and a referee. By asking and answering questions, the defender and challenger introduce new possibilities (mental models), understand them more completely, and learn one another's beliefs and preferences. The referee, who represents an external perspective, regulates the dialogue so that it reliably achieves the participants' objectives within the available time.

"Critical Thinking through Dialogue" training takes trainees through four phases of a critical dialogue (identifying a disagreement, deciding how to resolve it, challenging and defending positions, and resolution), and presents principles associated with each phase. Tactical decision game scenarios were used prior to training, for practice, and for a post-training test. The training led participants to surface information not previously shared and to make effective use of it. They were more likely to recognize and deal with disagreements, to ask for and give reasons for positions, listen more carefully, and seek creative solutions rather than premature compromises.

Current work is extending the theory and training to leadership skills.

Approaches To Critical Thinking

Definitions of critical thinking vary, but most share a common theme. Siegel (1997, p.14), for example, says that

> …being a critical thinker requires basing one's beliefs and actions on reasons… the beliefs and actions of the critical thinker, at least ideally, are *justified* by reasons for them which she has properly evaluated [italics in original].

Paul (1993) defines critical thinking as "a unique kind of purposeful thinking in which the thinker systematically and habitually imposes criteria and intellectual standards upon the thinking…."

Implicit or explicit in many definitions (Johnson, 1996, chpt. 12) is that critical thinking involves the deliberate application of a proper evaluative criterion *directly* to beliefs and decisions and the reasons for arriving at them. These definitions (and many others; see Cohen, Salas, & Riedel, 2002, for a review) reflect a particular paradigm. Critical thinking has traditionally been conceptualized from an *internalist* point of view, which (as the name suggests) packs everything relevant to the evaluation of an intellectual product into the consciousness of an individual (Feldman & Conee, 2000; Plantinga, 1993a, pp. 3-29). From this perspective, it is inappropriate to credit a person for a correct judgment or decision if she cannot justify it by an explicit reason. If she cannot say why she judged or decided in the way she did, then she got it right by accident (P. Klein, 2000). Expert physicians who are unable to explain a diagnosis (Patel, Arocha, & Kaufman, 1999, p. 82) are irrational, or at the very least cannot be good critical thinkers. By the same token, there is a set of rules for proper reasoning that applies to all situations at all times; if adoption of a belief fits those rules, it cannot be faulted, no matter else is going on. For example, it is unfair to fault a judgment or decision by reference to information of

which the person was unaware, even if readily available, or based on other rules, which are *not* intuitively compelling to that person. The purpose of this evaluation is "fairness" rather than effectiveness. As a consequence, critical thinking is supposed to evaluate a static, self-contained set of mental contents, in the light of universally compelling standards (e.g., logical, probabilistic, or decision theoretic) that specify how conclusions should be supported by reasons. Sosa (1991, p. 195) dubbed this view the "intellectualist model of justification."

A problem with internalism is that only a small subset of the reasons for a decision can ever be made explicit in critical thinking (Cherniak, 1986). As a result, the required absolute evaluative criteria do not exist. To varying degrees, everyone is in the same boat as the inarticulate expert physicians. Another problem is that, if applied "systematically and habitually" (e.g., as urged by Paul; also, Siegel, 1997: p. 16), the habit of asking for reasons leads to an infinite regress; to be a critical thinker is to be on a never-ending treadmill.

Questions arise about the potential usefulness of training such skills for use in real-world domains like the Army tactical battlefield: Will critical thinking take too much time, undermine the will to fight, supplant experience and even expertise, stifle innovation, or disrupt coordination? Unfortunately, the current state of the field does not provide encouraging answers. Critical thinking textbooks tend to emphasize (i) basing judgments and decisions on formal or informal logic, probability theory, or decision theory, and (ii) the avoidance of common fallacies (Hansen & Pinto, 1995) and biases (e.g, Kahneman, Slovic, & Tversky, 1982). Critical thinking is still regarded implicitly as a form of inner purity. The critical thinker's duty is to accept only beliefs seen clearly to follow from sound arguments, regardless of conditions or outcomes in the real world. There is little prescriptive research regarding pragmatic constraints on critical thinking that arise in time-sensitive domains.

Our objective was to place critical thinking in a more realistic context for practitioners. To accomplish this, we sought a conceptualization that would:

- Capture the idea of thinking about thinking without demanding that all (or even most) decision making be deliberative, or that all (or even most) reasons be made explicit.
- Be usable in time-constrained situations.
- Take account of constraints & obstacles due to social and organizational relationships.
- Enhance the effectiveness of strategies actually used by proficient decision makers (e.g., recognition, story-building).
- Be easy to teach, practice, and evaluate in real-world contexts.

These objectives commit us to an *externalist* point of view (e.g., Papineau, 2003; Lipshitz & Cohen, 2003). From that perspective, evaluation is based on the *reliability* of the process that generated a judgment or a decision in real-world environments of the appropriate kind. Critical thinking has a different look and status in the externalist perspective: (i) Externalist evaluation is highly context-dependent, and the most effective processes or methods are often domain-specific rather than general. A judgment or decision is justified if it is generated by a process that reliably achieves objectives under relevant conditions (Goldman, 1992, chpt. 6). (ii) Reasons for a belief or decision will be spelled out to varying degrees depending on the context, and there will always be a large residual dependence on the reliability of relatively automatic perceptual and inferential processes (e.g., rapid recognition-primed decision making; Klein, 1993). (iii) Evaluation based on effectiveness (rather than "fairness") is not limited to a person's consciousness. Cognitive and social processes that expose views to outside challenge or actively seek information from the environment are likely to increase reliability (Goldman, 1992, chpt. 10) and may be part of critical thinking. (iv) Feasibility is built into the notion of reliability.

Externalist criteria will favor strategies that are closely related to the way people already think over methods that are formally rigorous but impossible to implement (Lipshitz & Cohen, 2003). (v) No single method or process defines rationality. Critical thinking itself is not necessary for rationality, since intuitive or recognitional processes may be more reliable for achieving goals in familiar situations or when time is limited (Cohen, Freeman, & Wolf, 1996). At the other extreme, formal models might be worthwhile when their presuppositions are satisfied and an explicit computational implementation is available. Is there an externalist platform for critical thinking that realizes our objectives?

Dialogue and Thought

We propose an externalist perspective according to which critical thinking is, in essence, a form of *dialogue*. Dialogue theory studies reasoning and decision making as they actually occur in multiperson interactions rather than as a static set of logically related premises and conclusions (Hamblin, 1970; Rescher, 1977; van Eemeren & Grootendorst, 1983; van Eemeren et al., 1993). It seeks to identify the different types of argumentation (that is, the dynamic exchange of reasons for and against a conclusion) that are observed in conversation and the kinds of errors to which they are subject. Walton (1995, 1998) generalized the notion of dialogue beyond argumentation, defining it as any characteristic type of multiperson exchange with associated mutual expectations about roles, constraints, and purposes (Walton, 1998; Walton & Krabbe, 1995, p. 66). Based on that definition, he developed a classification of dialogue types, including negotiation, deliberation, inquiry, information seeking, and even quarreling.

Dialogue theory blends descriptive and normative concerns, beginning in bottom up fashion with real-world conversations. Researchers start with observed types of interactive exchange and then build idealized models. These models constrain how each type of transaction should be

conducted by participants who mutually recognize one another's desire to cooperate to achieve the goal of that particular type of dialogue. Dialogues thus lend themselves to evaluation at two levels: First, how effective is the chosen type of dialogue for achieving the larger goals of the participants in the current context? Second, how effectively have participants conducted themselves to achieve the goals of that type of dialogue? Dialogue theory promises an evaluative framework that directly maps descriptive and cognitive analyses of actual exchanges onto prescriptive process constraints to identify where they diverge.

Dialogue provides a paradigm for critical thinking that is descriptively richer and prescriptively more appropriate than internalist approaches based on logic, probability, or decision theory. Critical thinking dialogue leverages the functional similarity between rationally persuading another individual to accept or reject a position, and rationally determining for oneself whether a position is acceptable or not. A *persuasion dialogue* (Walton, 1998) or a *critical discussion* (von Eemeren & Grootendorst, 1992) externalizes necessary functions that must take place within an individual. In particular, both dialogue and critical thinking demand the adoption of different perspectives (e.g., a proponent, an opponent, and an external party who serves as facilitator, referee, or judge). Solo critical thinking may be fruitfully studied as a form of internal dialogue in which a single individual takes on these distinct dialectical roles (Walton, & Krabbe, 1995, p. 26). Moreover, variations among modes of critical thinking can be discriminated in terms of dialogue parameters, including purposes, roles, and constraints on types of questions and answers (including dialogues that are restricted to moves approved by logic and decision theory). Perhaps the most important functional similarity, and the one most highlighted by the dialogue perspective, is that both critical thinking and dialogues must be evaluated in terms of context-sensitive goals and costs. For example, in real-world argumentation

(as contrasted with formal proof), there is no *logically* enforceable end to potential challenges and defenses. It follows that critical thinking cannot be evaluated as an abstract intellectual product (e.g., a fixed set of premises that "entail" a conclusion). Like a dialogue, it needs to be conceptualized and evaluated as a process.

The similarity between critical thinking and a family of dialogue types may be based on more than functional analogy. First, a variety of developmental psychologists (e.g., Vygotsky, REF; Rogoff, REF; Tomasello, REF) have proposed that thought first develops as internalized speech and further, that we learn to reflect on and evaluate our own thoughts by responding to the thoughts and questions of others (Bogden, 2000). Second, as noted by Rieke and Sillars (1997), dialogue is the natural format for critical thinking by adults:

> …research suggests that critical thinking is really a mini-debate that you carry on with yourself. What is often mistaken for private thought is more likely an "internalized conversation (Mead REF), an "internal dialogue" (Mukarovsky REF), or an "imagined interaction" (Gotcher and Honeycutt REF).

Third, there is an even more direct reason for a dialogue-based theory of critical thinking. Thinking skills are not only learned in social interaction but continue to be manifested in social contexts (Hutchins, 1995). Much critical thinking takes place in a team or group context, in which dialogue plays a *literal* role in decision making. Dialogues are the interactions by means of which members of a team or group pool information and insights to solve a problem, resolve competing goals, build up shared understanding of the situation and task, and over time construct relationships that improve team cohesiveness and trust (Cohen, 2004). The fastest road to improved critical thinking in both an individual and a team may be training for critical dialogue.

A Theory Of Critical Thinking As Dialogue

As shown in Figure 1, our definition of critical thinking has three parts. *Critical thinking is (1) a question and answer (or more specifically, a challenge and defend) dialogue with oneself or others (2) about alternative possibilities (3) carried out for a purpose*. The dialogue-based theory of critical thinking draws on and synthesizes research on three separate topics: (1) descriptive and prescriptive models of critical discussion in which a proponent must defend a claim against an opponent or critic, typically by asking and answering questions (Walton, 1998; von Eemeren & Grootendorst, 1992); (2) cognitive theories of reasoning according to which alternative possible situations are represented by mental models (Johnson-Laird, 1983; Johnson-Laird & Byrne, 1991; Johnson-Laird et al., 1999); and (3) cognitive research that helps us assess the reliability of the processes by means of which we form beliefs and make choices – either by statistical measurement of outcomes (Hammond, 1993) or by research on expert performance (Orasanu & Connolly, 1993; Cohen et al. 1996).

Mental models are alternative "realities" regarded as possible by the parties to the discussion, circumscribed to include only variables currently regarded as relevant. A particular mental model may include not only beliefs about the situation and the significance of evidence, but also preferences, goals, and intentions to act. For the purposes of critical thinking, a decision maker's current situation understanding and plan is the set of mental models that are possible, or under consideration, in his or her present mental state. This set captures not only what the decision maker firmly believes or intends, but also the beliefs and intents that she regards as relevant but uncertain (i.e., whose truth values vary across alternative models).

A critical dialogue coordinates three perspectives or roles that reflect opposing attitudes toward uncertainty regarding an issue. Occupants of the first role (the *proponent*) try to reduce

uncertainty, by eliminating mental models in which the defended position is false. They present a position (an initial mental model) and defend it against challenges by adding further elements (i.e., reasons) that are consistent only with the truth of the position. Occupants of the second role (the *opponent*) try to increase doubt, by expanding the number of mental models to include some in which the defended position is false. They either demand reasons where none are present or introduce further elements (i.e., rebuttals) that eliminate existing reasons or neutralize the constraints that those reasons impose on the conclusion. In a somewhat more complex, *symmetrical* dialogue, both proponent and opponent also play the other's role with respect to a second, competing position. Thus, as questions are asked and answered, critical dialogue alters both the number of mental models under consideration and the number of variables used to characterize them, over a series of "moves" that are parts of complementary opposing strategies.

This process of questioning and defending mental models is adopted because of its *reliability* for achieving the purposes of the participants within the available time. Occupants of the third role (the *referee* or *facilitator*) regulate the process at two levels: the *internal* relevance of moves by each player to the goals of the dialogue and the *external* contribution of the dialogue as a whole to achieving a larger task or purpose within the available time. Despite their opposing roles within the dialogue, the proponent and opponent cooperate to accomplish a shared overall purpose, e.g., to test the acceptability of an uncertain position (which may include both assessment and plan) which affects the accomplishment of a larger task or activity. As a byproduct, because each may introduce factors not considered by the other, they increase their understanding of the situation along with their understanding of the other's point of view. Critical dialogues, when successful, should therefore improve decisions and situation understanding (by bringing more information to bear) and improve mutual or shared knowledge

(by exposing who knows or believes what).

Each of the three components of critical thinking shown in Figure 1 is associated with distinctive metrics of success, which progress from internal to external in their focus:

1. At its innermost core critical thinking involves selective consideration of *alternative possible states of affairs*, i.e., ensembles of mental models introduced by the proponent and opponent, respectively. Metrics of performance at this level include both external criteria (typically focused on individual issues) and internal criteria (focused on relationships among positions on different issues). Each of these has two variants: one concerned with maximizing (or, for opponents, minimizing) certainty, and the other with accurately representing the uncertainty that remains. Thus, external metrics include: (i) the amount of correspondence between individual claims and current observations or substantiated empirical generalizations, and (ii) appropriate representation of the uncertainty of a position by the relative number of possibilities in which it is false. Internal metrics include: (iii) coherence among the claims that co-exist within any given model, both among themselves and with prior knowledge, and (iv) appropriate representation of the overall plausibility of a mental model by the extent to which it is represented in the ensemble of possible worlds. (i) and (ii) correspond to resolution and calibration, which are quantitative measures from frequentist probability theory (REF). Coherence and plausibility as referred to in (iii) and (iv) measure the degree to which a given mental model is a good theory. They may be based on explanatory principles and criteria within a relevant domain of inquiry, and therefore draw heavily on implicit, domain-specific standards of when it makes sense to introduce new explanatory variables to a model. General ideas of what constitutes a good theory, which trade off the

number of parameters against predictive utility, have been developed by Sober & XXX (REF) and others.

2. Mental models are embedded within a process of *critical questioning* which motivates the generation, elaboration, and evaluation of possibilities. As noted, such dialogues may take place within a single individual, or they may be conducted among different individuals. Critical questioning is evaluated by reference to norms for conducting the appropriate kinds of critical dialogue, that is, constraints or rules that reliably enable the purpose of the dialogue to be efficiently accomplished. Such rules may be designed (and evaluated in terms of) specific purposes, for example, to keep the conversation moving until there is a small enough chance that relevant information has not yet been brought forward. For example, rules may require the proponent on any given turn to either respond to a challenge by the opponent or concede, and may require the opponent on any given turn to either raise a challenge or drop her opposition.

3. At the outermost layer, critical thinking is a judgment about the *reliability* of a cognitive strategy, trait, or social process for achieving goals under various conditions. Mental models may be cogent and the challenges and defenses relevant, but if the dialogue itself will not contribute to important goals within the time available, it should not occur. Different types of critical dialogue, as well as other processes like pattern recognition or the nominal group technique, are among the available cognitive or social tools that might be utilized to effectively generate or modify beliefs and decisions. Moreover, types of critical dialogues can be differentiated by the depth of probing to which a proponent must respond and the scope of the possibilities that may be considered, depending, for

example, on whether the dialogue is intended to solve a time sensitive pragmatic issue or dig out and evaluate fundamental but hidden assumptions.

In sum, critical thinking skill is exemplified by the interaction of challenges that introduce alternative possibilities and defenses that eliminate alternative possibilities – with the proximal goal of testing the acceptability of a claim and the distal goal of reliably contributing to the accomplishment of a larger task. More detailed discussion of this theory can be found in Cohen (2000) and Cohen, Salas, & Riedel (2002). An extension and generalization of it can be found in Cohen (2004).

Hypotheses. The *common knowledge effect* is a well-documented shortcoming of group decision making that critical dialogue might mitigate. Group members are more likely to discuss information they already hold in common, even when there is more valuable unshared information; moreover, even when unshared information is mentioned, it has less impact on group decisions (Stasser, 1996; 1999). We predicted that teams trained in critical dialogue would be more likely to (i) pool information and (ii) use the pooled information to develop novel solutions. More specifically, training would increase the frequency with which team members discussed information not already held in common by members of the team and the frequency with which they made effective use of that information.

Training Critical Thinking Through Dialogue

Based on these ideas, we developed a training package called *Critical Thinking through Dialogue*. At the time of the study reported here, the training package was not stand alone, but was presented via slides and handouts by an instructor. Classes generally consisted of a group of 2 to 4 officers, usually of the same rank. Tactical decision games from the *Marine Corps Gazette* were used for testing before and after training, as well as for demonstration and practice during

training (Schmitt, 1994). These are one-page descriptions of tactical situations, in which readers adopt the perspective of a company or battalion commander and then develop brief operations orders for their subordinates. (See below for more details.)

The training began with a discussion of the concept of a critical dialogue, as a type of "game" in which the skills of critical thinking could be learned and put into practice. The instructor provided an overview of the three roles (proponent, opponent, and referee / facilitator) and associated rules. The instructor emphasized that the roles in critical dialogue need not correspond in any specific way to rank. *Within the context of this game*, the commander is voluntarily subject to the same rules as other players. The instructor then explained the four phases of a critical thinking dialogue (adapted from von Eemeren & Grootendorst, 1992): (1) Identifying a disagreement or uncertainty, (2) deciding how to resolve it, (3) challenging, defending, and modifying positions, and (4) resolution of the problem (Table 1). The presentation of each phase was accompanied by discussion of tasks and principles associated with each phase, guided practice, and feedback during and after the practice.

Participants were taught rules specific to each phase as well as more general principles for critical dialogue. For many of these, they were shown common ways in which it tends to be violated (called "fouls"), and examples of each kind of violation. Two of the most important rules are shown in Table 2.

Finally, the role of the referee / facilitator was explained:

- Prioritize use of time. Direct discussion to priority issues that need to be decided soonest. Stop the discussion of an issue whenever an immediate decision is necessary on that issue. Stop the discussion when continuation is not likely to be fruitful or when other high-priority issues need to be discussed.

- Keep discussion going if someone appears to concede soon. (Example: *We still have some time. Don't give up yet. Work harder to come up with a better defense of your position or a modification that meets the objections.*)
- Energize discussion if it gets into a rut or peters out. (Example: *Don't repeat the same points. Come up with new ideas. An infallible crystal ball says there are other problems with the plan. What are they?*)
- Call foul if a party violates the rules (e.g., *Aren't you changing the subject? Let's stay on this topic for now.*)

Method

Participants. 54 active duty Army officers participated in the study. They included 46 majors and 8 captains, from Fort Hood, Fort Bragg, Fort Carson, and Fort Riley, and were tested in a total of 20 sessions. We requested that three officers of varying ranks attend all sessions (corresponding to the three dialogue roles discussed above). However, participants' scheduling constraints had to be accommodated, which resulted in the variation of number in attendance from 2 to 4. The silver lining was that we gained experience with the techniques in groups of varying sizes. With four officers present, two individuals worked together in either the proponent or opponent role. With two officers present, the two participants acted as proponent and opponent, respectively, and were instructed to act jointly as their own referee (a fairly common situation, for example, in pick-up games of baseball and basketball). If only one participant showed up for a session, it was cancelled.

Procedure and Materials. Each experimental session was 3.5 hours in duration, broken down into the following activities:

Activity	Duration (min)
Introduction, consent forms, bio information	15
Pretest	45
Critical Thinking Training	60
Posttest	45
Debriefing	15

The participants took breaks after the pretest and after the training.

Two brief tactical scenarios taken with permission from the *Marine Corps Gazette* (Schmitt, 1994) were used as pretest and posttest, counterbalanced across groups. In one of the scenarios ("Attack on Rocky Run Hollow," TDG #99-11), participants play an infantry battalion commander who must issue orders to company commanders. In the other scenario ("Clash at Timpan-ni, Part II," TDG #97-11), they play a rifle company commander who must direct platoon leaders. For the pretest and posttest, each participant was given a one page write-up of the scenario, multiple copies of a scenario tactical situation map, blank paper, and colored markers. Their instructions were to develop an operations order and a scheme of maneuver in written form, first as individuals then as a team. Operations orders specify a task and purpose for a military tactical unit as a whole and for each of its subunits. A scheme of maneuver shows graphically where each subunit is to move or be positioned in relation to the terrain and enemy. To specify a scheme of maneuver, participants used colored markers on copies of the preprinted maps.

In both pretest and posttest, participants first worked as individuals for 15 minutes, reading the scenario and writing out their own course of action and scheme of maneuver. They then

worked for 30 minutes as a team, sitting together at the same table. The team task was to generate a consensus plan (operations orders and scheme of maneuver) within the specified time limit. A timer was placed on the table within view of all team members. Teams were told that how they organized themselves for this task was entirely up to them, during both pretest and posttest. This included how they managed the discussion, who if anyone functioned as leader, scribe, or time keeper, and the process by means of which they arrived at a consensus.

The instructor and trainees reviewed and reworked the pretest scenario of each team for practice during the training. A third tactical decision game ("Bridgeton Crossing, TDG #98-4) was used to demonstrate topics in the training and for additional practice.

Dependent measures. Statistical inferences generally pertained to team rather than individual performance. In particular, the effect of training was assessed by comparing before training (pretest) and after training (posttest) scores for each team. Measures were based on (i) examination of the written operations orders and schemes of maneuver produced by the teams (as well as by team members before they joined with the team) and (ii) analysis of transcripts of team discussion. Dependent measures discussed in this chapter included: the frequency with which team members recognized points of disagreement and agreement among themselves, allowed one another to speak without interruption, asked for or offered reasons, and generated novel courses of action (not previously generated by any individual) in response to new information. The latter measure was based on written solutions to tactical problems submitted by individuals and teams, while all the others were based on transcripts of team discussions.

Larger teams, as might be expected, recognized more agreements and disagreements, produced more interruptions, and generated more courses of action. However, variation in the size of teams across sessions (from 2 to 4 members) does not confound the interpretation of

results here. Each team performed on both a pretest and posttest in the same session with the same team members. (Participants who could not remain for the entire session were dismissed before it began.) Within-group t-tests, therefore, compare each team's post-test score with the pretest score for the identical team.

Preliminary Results

The following results are quite preliminary. They are based on the seven (out of 20) groups who have been analyzed thus far.

Recognition of agreement and disagreement. Phase 1 of a critical dialogue involves recognizing and clarifying areas of agreement and disagreement, settling inconsequential differences, and focusing on the significant disagreements (Table 1). Rule A requires that participants in such a dialogue not suppress disagreement, but allow expression of all views (Table 2).

Six of seven groups recognized more *disagreements* among themselves in the posttest than in the pretest (one group was unchanged, at zero) (Figure 2). Trained groups recognized an average of 3.14 more points of disagreement than untrained groups ($t_6 = 3.553$ two-tailed, $p = 0.012$). Training also increased the likelihood that groups would explicitly recognize aspects of the plan on which they agreed (five of seven groups, Figure 3). Trained groups recognized an average of 5.29 more points of agreement than untrained groups ($t_6 = 3.796$ two-tailed, $p = 0.009$). From the perspective of the training, the purpose of recognizing agreement was to allocate more time to points of disagreement. Informal observation of each session showed that groups set aside points of agreement and tended to focus conversation on points of disagreement, as prescribed.

There were other, more indirect indicators that training improved expression of divergent views. The heart of a critical dialogue occurs in phase 3, when proponent and opponent exchange reasons for and against a position (Table 1). Rule B requires that anyone who asserts a position is required to give reasons in its favor (Table 2). There was a tendency of training to increase the number of times participants *requested* reasons for the views of others and *gave* reasons for their own. Trained groups mentioned 1.43 more reasons than untrained groups (t_6 = 1.987 two-tailed, p = 0.094). (These two measures were aggregated because of their interaction: (i) Offering a reason often occurred as a result of a request, and (ii) when a reason was offered without being requested, it obviously preempted such a request.) As another example, training reduced the number of times that people interrupted one another in five of the seven groups. There were an average of 1.43 fewer interruptions in trained groups than in untrained groups (t_6 = 2.200 two-tailed, p = 0.070). A more complete understanding of the significance of theses findings awaits further analysis and examination of transcripts.

Generation of new options by teams. There is evidence that decision making substance, as well as process, might be influenced by training. For five of the seven teams, training increased the number of new courses of action for major ground maneuver units that were generated for the first time in the group context (Figure 4). Three of these groups had generated *no* new options at all during team discussions in the pretest, i.e., all major options considered were first thought of by individuals before they convened as a group. On the average, trained teams originated one (more precisely, 1.14) option more than untrained teams (t_6 = 2.828 two-tailed, p = 0.030). Moreover, 54% of the options generated for the first time by the team made it into the final team operations orders.

Discussion And Conclusions

The analysis of these data is not yet complete, and we are a long way from our goal: assessing the reliability of critical dialogue for improving the quality of decisions. Most saliently, the extremely brief interval between training and posttest permits no inferences about lasting effects. However, there are indications in the preliminary results that within these constraints at least, the training had an effect on both process and substance, and that the effects were positive. We will consider the two parts of our hypothesis in turn: That training made groups more likely to discuss unshared information (process) and also more likely to change their decisions based on such information (substance).

With respect to process, training led to better prioritization of issues for discussion and thinking. After training, groups were more likely to recognize (and set aside) areas of agreement and more likely to recognize (and focus on) areas of disagreement. They also tended to ask for and give more reasons and to interrupt the expression of others' views less often. It is not implausible to suppose that these changes were accompanied by a better understanding of the strengths and weaknesses of alternative plans. Both the greater focus on disagreement and the more active sharing of reasons suggest that groups might have been less susceptible to the common knowledge effect after training than before. Critical dialogue training might reduce the tendency of groups to focus on information that group members already share at the expense of valuable information that other group members do not possess.

With respect to substance, groups developed more new options for major ground maneuver units after training than before. This increase was not attributable to an increase in the frequency with which individuals were able to *express* views already developed when they worked alone (i.e., it is not a special case of the finding in the previous paragraph). By definition, the options

captured by this measure had not been generated during individual decision making but were generated *for the first time* during group discussion. It is reasonable to conjecture that new options were generated in response to the exchange of non-shared information. Unfortunately, we found no significant effect of training on any specific feature of the final plans recommended by the groups.

Even though we have cited the generation of more courses of action as an improvement, we do not think that generating more courses of action is always a good idea or will always improve decisions. In particular, when done as an *obligatory* step in the decision making process (as often proposed), it may well steal time that could be put to better use understanding the situation or challenging and improving a single good option (Simon, 1997). In this study, there is an important difference: The result is not due to *any* specific instruction or encouragement with respect to option generation. There was no "option generation" task in the training; the closest thing to it was mention of modifying a favored option as one way to answer objections. Examination of transcripts shows that the new courses of action were generated as solutions to specific problems raised in critical dialogue. We do think that the development of new options *in response to specific challenges and problems* will improve decisions and plans. It also supports the second part of our hypothesis, that trained groups would make effective use of unshared information in decision making.

This finding suggests that trained groups were less likely to bargain or compromise in order to achieve consensus, e.g., by trading concessions on different parts of the plan (the last clause in Rule B, Table 2). A trading strategy would discourage the generation of new options, since it requires combination of options chosen by different group members. The fact that groups sought out more creative solutions instead is an encouraging sign that dialogue training may lead to

improved performance in real-world tasks. The finding reflects improved collaborative problem solving by groups trained only in dialogue.

We are now generalizing our approach both to dialogue and dialogue training. The expanded framework allows a more prominent role for recognitional as distinct from deliberative processing during dialogue and extends the theory to interpersonal skills required for leadership as well as critical thinking (Cohen, 2004). For example, we developed the concept of a *dialogue mental model* that underlies the recognition of intended conversational transactions by matching an extended segment of discourse rather than individual utterances (as in *speech act theory*, Searle, 1969). Such structures provide a source of shared stimuli for mutual recognition of the intended transaction. Once the interaction begins, participants use such mental models as plans for conversational behavior and as sources of enforceable mutual expectations about how the transaction should be conducted. Skilled participants use strategies for navigating through these structures that avoid threats to the freedom of action and self-esteem of other participants as well as themselves, in accordance with *politeness theory* (Brown & Levinson, 1987). In doing so, they employ conversational devices that enable them to influence the flow of conversation and avoid undesired control by others (Sacks, 1995). We are planning experiments to test whether cognitive dialogue training based on these concepts will help leaders and others learn to understand the purpose and practice of different types of dialogue (e.g., request, negotiation, deliberation, inquiry), initiate them when appropriate, recognize them when initiated by others, and understand and respect the constraints and expectations associated with dialogue roles at each stage of the transaction (Cohen et al., 2004).

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Table 1. Phases of a critical discussion and their associated tasks.

Stage	Tasks
1 **Confronting opinions**	a. Individuals think about problem separately. (Group is more effective after members have thought about issues independently, even if just for a short time.) b. Express own views. c. Learn what others' positions are and why. Ask for clarification if not clear.
2 **Planning discussion**	a. Recognize and expand areas of agreement (e.g., quickly settle minor differences and distinctions without a difference). a. Recognize and understand significant disagreements. b. Determine what disagreements are important enough to discuss, and prioritize them. If there is no disagreement, determine the most critical issues or uncertainties. (Look at actual disagreements first, because an uncertainty is more likely to be significant if people have actually adopted different positions on it.) c. For high priority issue(s), quickly: Decide approximately how much time you have. Decide who plays primary roles of defender and challenger. (If players have competing claims, each plays both roles.) Designate someone to play referee / facilitator. This may be someone with no other role, or it may be the proponent and opponent jointly. If more than three people, assign teams to roles.
3 **Point-counterpoint**	a. Parties take turns. b. On each turn, proponent must respond directly to each challenge by the other side. Each response must defend position with reasons, modify the position, or concede. c. On each turn, opponent must either challenge the other position or concede. Each challenge must demand a defense, question the truth of a reason, question the sufficiency or relevance of a reason, or present an alternative coherent viewpoint (e.g., a better explanation of the observations). d. Referee / facilitator watches time, keeps discussion going, and makes sure rules are being followed.
4 **Decision**	a. End the discussion when parties agree, or referee / facilitator or CO declares time is up. b. Identify recommendation or decision of the group: This may be by concession of one of the parties, or else it may be the referee / facilitator or the CO's decision. c. Summarize the strengths and weaknesses of each side, and explain why decision was made.

Table 2. Basic rules for critical dialogue.

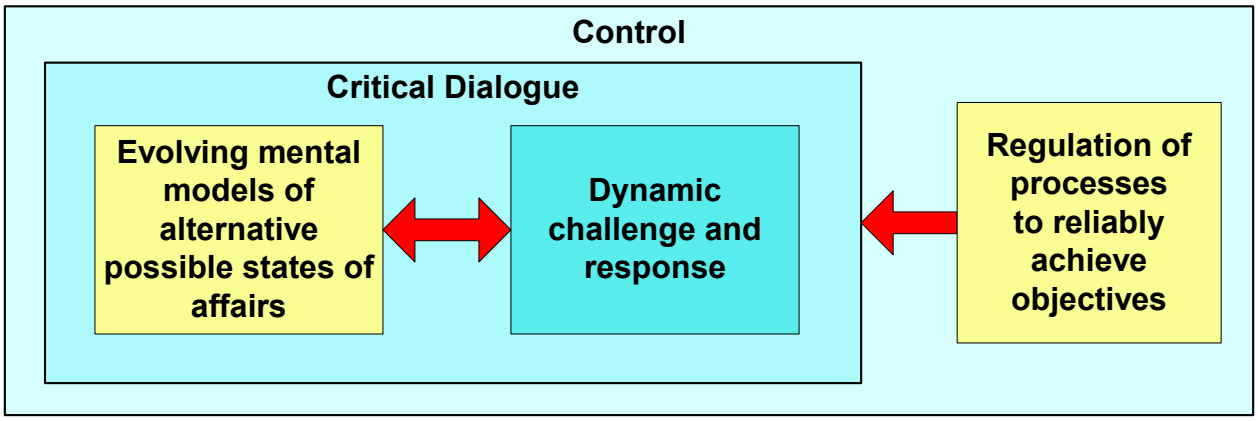
Rule	Fouls to avoid	Examples of foul
A **Don't suppress disagreement, or prevent each other from defending or challenging positions.**	No intimidation by use of authority or expertise	*If I want your views, I'll ask for them.*
	Don't distort others' views (create a strawman)	*So, you cowards just want to cut and run?*
	No personal attacks on competence or motives	
	No appeals to sympathy of other party	*Give me a break! No one ever accepts my ideas. Just go along with me this one time!*
B **Whoever makes a claim has to defend it if asked to do so.**	Don't ask others to rely on your personal guarantee.	*I'm the expert here. I don't have to defend my views.*
	Don't declare your conclusion to be obvious.	*Everybody knows that…*
	Don't turn the tables.	*Well, I'd like to see you prove that I'm wrong.*
	Don't bargain. Settle issues on the merits.	*I'll let you have your way on the 1st platoon if you'll accept my suggestion on the tanks.*

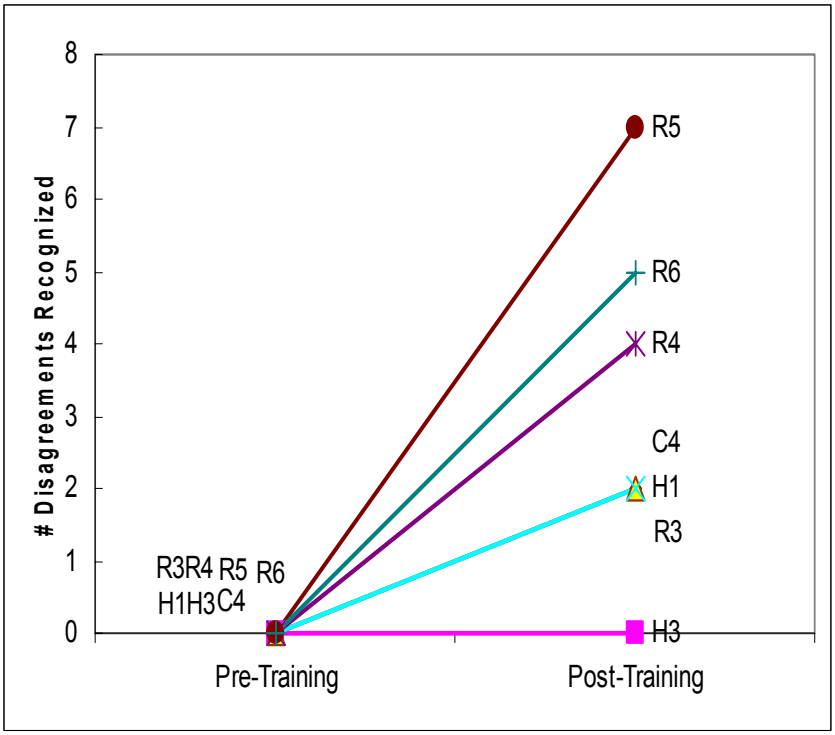
Figure 1. Overview of the theory of critical thinking as dialogue.

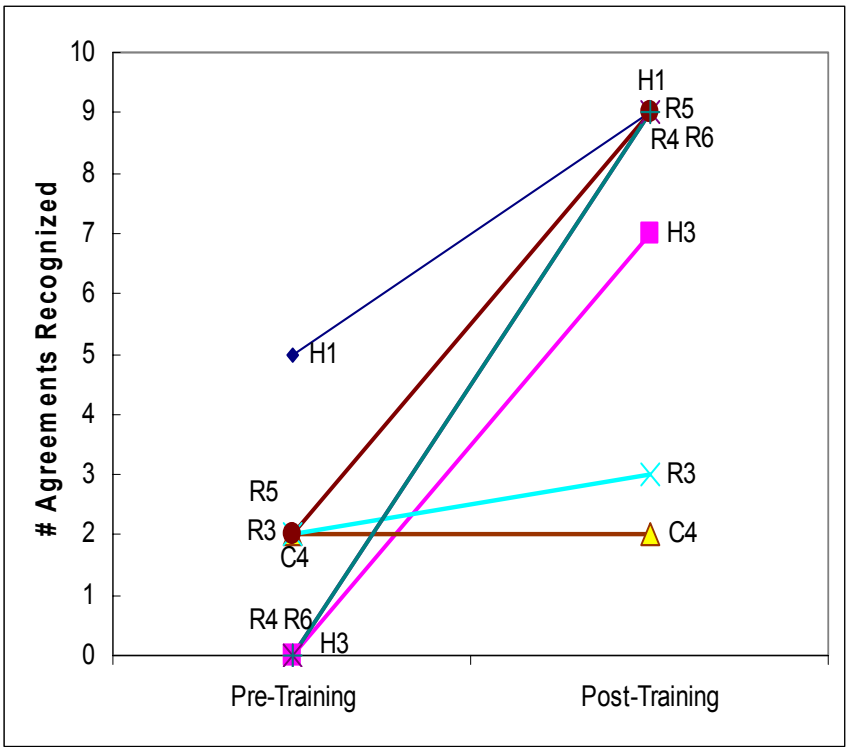
Figure 2. Influence of training on recognition of disagreement (left) and agreement (right). Labels indicate which team is the source of each pretest-posttest comparison. For example, H1 is the first team at Fort Hood; C4 is the fourth team at Fort Carson; R3 is the third team at Fort Riley; and so on.

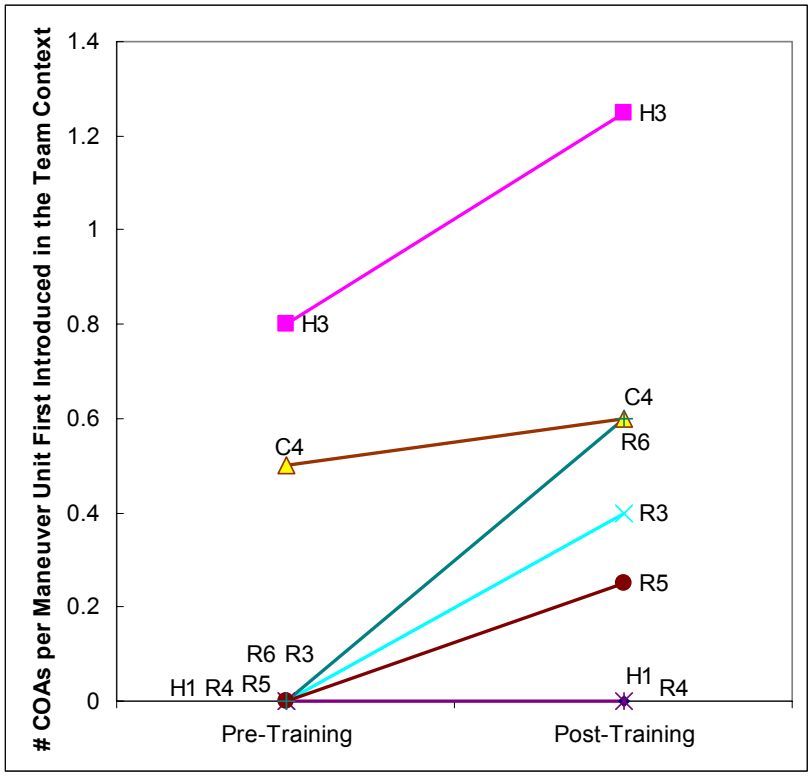
Figure 3. Influence of training on recognition of disagreement (left) and agreement (right). Labels indicate which team is the source of each pretest-posttest comparison. For example, H1 is the first team at Fort Hood; C4 is the fourth team at Fort Carson; R3 is the third team at Fort Riley; and so on.

Figure 4. Influence of training on the number of courses of action discussed in the team context for the first time, i.e., that had not been previously developed by individuals working alone. The number of new COAs is divided by the total number of maneuver units. Labels indicate which team is the source of each pretest-posttest comparison. For example, H1 is the first team at Fort Hood; C4 is the fourth team at Fort Carson; R3 is the third team at Fort Riley; and so on.


Control
Critical Dialogue
Evolving mental models of alternative possible states of affairs
Dynamic challenge and response
Regulation of processes to reliably achieve objectives


Disagreements Recognized
8
7
6
5
4
3
2
1
0
R5
R6
R4
C4
H1
R3
H3
R3R4 R5 R6
H1H3C4
Pre-Training
Post-Training


10
9
8
7
6
5
4
3
2
1
0
Agreements Recognized
H1
R5
R4 R6
H3
R3
C4
H1
R5
R3
C4
R4 R6
H3
Pre-Training
Post-Training


COAs per Maneuver Unit First Introduced in the Team Context
1.4
1.2
1
0.8
0.6
0.4
0.2
0
H3
H3
C4
C4
R6
R3
R5
R6 R3
H1 R4 R5
H1
R4
Pre-Training
Post-Training