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Nurturing Students' Meta-Cognition and Self Reflection Through On-line Journaling

Dean Carol Ann Gittens

Dr Carol Ann Gittens is Professor and Dean of the Kalmonovitz School of Education at Saint Mary's College of California. She has served as the Director of Assessment and Associate Dean of the School of Education, Counseling Psychology and Pastoral Ministries at Santa Clara University. In addition to her administrative roles, Dr. Gittens teaches critical thinking pedagogy, developmental psychology, foundations of education, curriculum innovation, educational assessment, research methods, and community health education. Her research examines the relationship between critical thinking, motivation, and academic achievement in adolescent and young adult samples. She is author of the [EDUCATE INSIGHT](#) series of K-12 critical thinking skills and mindset assessments, and a collaborator on numerous other college and adult level reasoning skills and thinking mindset assessment instruments.



In this chapter, Dr. Gittens describes the use of computer-mediated communication (CMC) to provide students with the opportunity to more deeply interpret, analyze, and draw inferences from classroom content or field experiences. The lesson brings important insights not found elsewhere in this volume on how to focus the training of thinking on specific skills (problem framing, analysis of consequences, and the explanation of evaluation). Dr Gittens presents the Critical Thinking (CT) Reflective Log, an on-line journaling assignment that was first developed to nurture pre-service teachers' reflective and meta-cognitive skills. It is a wonderfully adaptable lesson for students and clinicians at all levels of practice, well referenced to assist those new to the field of educational research, and it offers a focused effort to build skills in meta- cognitive awareness and critical reflection. Although presented here in a book dedicated to health care educators, Dr. Gittens' Reflective Log can readily be applied in a very wide variety of professional training and educational contexts -- in fact, anyplace where training in reflective problem-solving and thoughtful decision-making is advantageous.

Background and Context

As computer-mediated communication (CMC) becomes more and more common in higher education, learning opportunities expand beyond the physical and temporal boundaries of the university classroom (Frank, 2004; Van Gorp, 1998). Substantial benefits to students result from using CMC to augment face-to-face classroom discussions (Dutt-Doner &

Powers, 2000; Frank 2004; Jetton, 2004, MacKnight, 2000; Thomas 2002; Wepner & Mobley, 1998). One of the most noted benefits from using CMC is that it permits students to share and discuss with one another their beliefs and experiences about the content of a course or issues pertaining to field experiences (Andrusyszyn & Davie, 1997; Jetton, 2004; Wepner & Mobley, 1998). A second benefit is that CMC serves as a tool to facilitate collaborations on projects or other shared activities. A third benefit is that CMC provides a virtual learning environment that offers students opportunities to more deeply process information that has been presented in class or is being offered by classmates, and thus to build their critical and reflective thinking skills as they participate in the online discussions (Andrusyszyn & Davie, 1997; Frank, 2004; Harasim, 1990, 2000; Jetton, 2004; Hawkes & Romiszowski, 2001; McComb, 1993, Newman, Johnson, Cochrane & Webb, 1996). The purpose of this paper is to present the Critical Thinking (CT) Reflective Log, an online journaling assignment that was developed with the express purpose of nurturing students' reflective and meta-cognitive skills.

The conceptualization of critical thinking that serves as the foundation for the CT Reflective Log is derived from the consensus definition articulated by the American Philosophical Association (APA). In 1990, under the sponsorship of the APA, a cross-disciplinary panel completed a two-year Delphi project yielding a robust conceptualization of CT understood as an outcome of college level education (Facione, 1990). Before the Delphi Project, no clear consensus definition of critical thinking existed (see Kurfiss, 1988 for a review). Broadly conceived by the Delphi panelists, CT was characterized as the process of purposeful, self-regulatory judgment. Throughout this cognitive, non-linear, recursive process a person gathers and evaluates evidence in order to form a judgment about what to believe or what to do in a given context. In so doing, a person engaged in CT uses his/her cognitive skills to form a judgment and to monitor and improve the quality of that judgment (Facione, 1990).

Contemporary critical thinking scholars acknowledge that any discussion of critical thinking must include both thinking skills and thinking attitudes, or dispositions (Ennis & Norris, 1990; Halpern, 1996). The term critical thinking disposition refers to a person's internal motivation to think critically when faced with problems to solve, ideas to evaluate, or decisions to make (Facione, Facione & Giancarlo, 1997; Giancarlo, Blohm & Urdan, 2004). These attitudes, values, and inclinations are dimensions of one's personality which relate to how likely a person is to approach problem identification and problem solving by using reasoning. Many would agree with the assertion that it is pointless to learn a skill if, when you find yourself in situations that require the skill, you fail to exercise what you have learned. The honing of one's CT skills, as well as developing the disposition to use one's skills, is vital for success in school and throughout a person's life (Halpern, 1998).

Can critical thinking be accomplished in an on-line environment? Astleitner (2002) provides one of the most thorough reviews of educational literature as to whether critical thinking can be nurtured in an online environment. Astleitner considered multiple modes of electronic communication as well as dynamic differences presented by synchronous versus asynchronous environments. A major contribution stemming from this review was Astleitner's assertion that educators interested in using CMC must craft the online assignment with care, that the assignment be integrated with other course activities, and finally that educators consider the motivational and emotional elements that can impact learning in an online environment (Astleitner, 2002).

Newman and colleagues performed a series of studies to investigate how computer-mediated communication compares to face-to-face interaction in terms of the quality of group learning in college level courses. Newman, Webb and Cochrane (1995), in their examination of students' asynchronous discussion postings, found that students were more likely to provide thoughtful reflection as opposed to novel, creative ideas. They concluded that the asynchronous nature of on-line discussion activities seems best suited for encouraging students to make contemplative, and more considered contributions. The strengths of this line of inquiry include an emphasis on the need to examine the quality of the content of students' on-line discussions not just the quantity or frequency of those interactions (Newman, Webb & Cochrane, 1995).

Issues of democracy, community, gendered discourse, and critical thinking within computer-mediated discussions have been investigated. Fauske and Wade (2004) examined whether gendered power differences often seen in face-to-face discussions would also be present in an online discussion assignment in a teacher education course. The authors found that males and females were similar in the tendency to create a supportive, intellectually challenging and inquiry-based discussion forums. Fauske and Wade offered recommendations that educators critically examine how they plan and

participate in CMC assignments and that asynchronous environments be used to allow students to reflect on their posts to increase the likelihood of thoughtful responses.

An Overview of the Exercise

This chapter presents a reflective log assignment developed to nurture students' critical and reflective thinking skills. The CT Reflective Log was first created in collaboration with Dr. Peter Facione as an assignment in a senior Capstone seminar for students majoring in Liberal Studies. With experience I've learned that there is more potential benefit to students' critical thinking *if the exercise is introduced early in an educational program*. I further revised this lesson in 2001 when I began *using it with an on-line asynchronous bulletin-board software program to deliver the assignment* as an accompaniment to students' out of class discussion. Well-designed online discussions have been shown to enhance students' inquiry and reflection during field experiences (Dutt-Doner & Powers, 2000; Edens, 2000; Frank, 2004; Wepner & Mobley, 1998).

The CT Reflective Log can be viewed as a form of case study analysis where the students create their own authentic critical thinking case studies based on real life experiences rather than contrived cases created by the professor. Students document the cases and then engage in critical evaluation, analysis, and reflection to promote their awareness of strong and weak reasoning as exhibited by others and themselves (Chong, 1998; Jetton, 2004; MacKnight, 2000). The CT Reflective Log is one part of a multifaceted instructional approach that includes a dialogical style of classroom teaching as well as readings that address CT and other topics pertaining to education and the profession of teaching.

The Learning Outcomes

Students who complete this capstone seminar will be able to:

1. Demonstrate increased meta-cognitive awareness about the role of critical thinking in teaching and learning
2. Infuse one's teaching practices with a pedagogical eye toward critical thinking.
3. Exercise cognitive skills in critical thinking (analysis, inference, interpretation, explanation, evaluation, and meta- cognitive self-regulation).
4. Develop a stronger disposition toward critical thinking (truth-seeking, open-mindedness, analyticity, systematicity, confidence in one's thinking, cognitive maturity).
5. Detect, evaluate, and log striking examples of good and bad thinking in daily life.
6. Demonstrate one's ability to critically evaluate information available (from the Internet and other sources) and develop basic information technological skills.
7. Estimated one's own level of fair-mindedness and critical thinking skill.

Implementation of the CT Reflective Log

On the first day of class, students receive the CT Reflective Log assignment as part of their course syllabus. I've included the CT Reflective portion here at the end of this chapter so you can refer to it as needed. To complete their assignment, students are asked to integrate a specific new question into their daily conversations each week. The instructor implicitly directs the development of critical thinking through these intentionally crafted weekly questions and the targets of the inquiry specifically identified (King, 1995; MacKnight, 2000). Though students are asked to engage each week with a unique critical thinking reflection prompt, these prompts can be clustered into three major categories: 1) *evaluation of evidence*, 2) *analysis of alternatives or consequences*, and 3) *problem identification and problem framing*. Of these, the majority of weekly prompts pertain to the evaluation of evidence. For this first category, prompts from weeks 2, 3, 7 and 9 are relevant. Weekly prompts 4 and 6 serve the second category. Prompts 5 and 8 address the third category. Finally, the last prompt in the assignment requires each student to reflect meta-cognitively on what she or he has learned about his or her own thinking as a result of the journaling activity.

I teach at a university that is on the quarter system and thus there are only nine or ten weeks to implement this assignment. Instructors who teach on a semester system can include additional self-referent prompts of this second

categorical type to provide students with more opportunities to overcome the challenges that are presented by reflecting on the degree to which sufficient attention has been paid on anticipating consequences and evaluating alternatives in regard to personal decisions.

Students are told that each weekly prompt can be modified to reflect their personal style of speech, as long as the main gist of the question remains intact. They are told specifically to whom the question must be addressed. Sometime the questions must be posed to members of a group (e.g., college graduates, or fellow students not enrolled in the present course), and other times the questions are to be posed to a narrower range of acquaintances, such as best friends, or a professor of their choosing. Finally, some of the questions are reserved for personal reflection. Directing the questions to different targets helps students to generalize their growth in meta-cognition to broader contexts.

What is expected from class participants?

Each week students are asked to select a salient interaction and post a discussion of that interaction on the class's electronic bulletin board. The description, they are told, should protect the anonymity of those involved, but should provide enough contextual information for the reader to be reasonably able to envision the exchange. I ask my students to first convey the interaction and then evaluate the quality of thinking expressed in the interaction. They are to indicate whether the thinking was strong or weak, and to explain why they are making their determination. As an additional layer of complexity to this aspect of the reflective log assignment, out of the nine total posts students will be making throughout the term, only three can be posts recounting encounters deemed to be examples of strong thinking. *The requirement that students must write about examples of weak thinking is based on the idea that, regrettable as it may seem, the most fruitful learning experiences are often negative ones.* Consequently, students are encouraged to strive to find experiences of weak, poor, flawed, fallacious, uncritical, or erroneous thinking. However, since it takes some familiarity with quality to appreciate and to seek excellence in one's own thinking, some of the entries in the log were to be about strong, correct, high quality experiences.

In addition to their original weekly postings, students are obligated to "reply" to at least two other students' posts each week. Early iterations of this assignment asked students to submit their reflections in a handwritten "lab book". As educational technology became more commonplace, the written journals were transitioned to responses emailed to the instructor, and then finally to online bulletin board posts to all in the course. *Along with the transition to a more public submission of the reflections was the addition of online peer replies.* This aspect of the assignment was added as a means for training students' skills in providing professional peer feedback and to lessen the burden on the professor as the sole source of feedback.

An Analysis of the Design of the Reflective Log Assignment

Recall that three category areas are covered in the CT Reflective Log: evaluation of evidence (EE), consideration of alternatives and / or consequences (AC) and problem framing (PF). The first question that was considered addressed whether there were any prominent themes stemming from the three categorical prompt types.

EE: The Evaluation of Evidence. Four of the nine prompts ask students to evaluate the extent to which sufficient evidence was being provided to support an asserted claim or point of view. In three of the Evaluation of Evidence prompts the students are asked to solicit and evaluate supporting evidence from another person, and the fourth EE prompt was to evaluate the evidence provided in a television commercial. The goal of the first prompt ("Why do you think that?") is to engage the students in the activity of analyzing the quality of explanation. This explanation provides both a snapshot of the critical thinking skills of the targeted respondent, as well as the skills of the student who must then evaluate the ability to distinguish between *evidence* and *opinion*. The subsequent posts relating to the evaluation of evidence, in weeks 3, 7 and 9 provide students with additional practice in this valuable critical thinking skill, namely the ability to judge the soundness of an argument based on the evaluation of evidentiary support.

AC: Analysis of Alternatives / Consequences: Weekly prompts 4 and 6 focus students' attention on the consideration and analysis of alternatives or consequences in a decision-making situation. In the Week 4 prompt, the students are to ask someone who has attained a higher level of education than themselves (in this case a college graduate) 'what else they had considered.' Week 6 asks students to consider the implications of a personal decision. The cognitive skills and dispositions nurtured by these prompts are multifaceted. They differ from the Evaluation of Evidence prompts. When asking a respondent to reflect upon a prior decision, students are exposed to the extent to which the respondent endeavored to identify her or his options, and the degree to which these options were seriously considered. A reflection upon one's own process of identifying alternatives and considering consequences is what confronts students in week 6. The act of seeking to identify options and alternatives is evidence of one's inquisitiveness and open-mindedness. To have consequences to consider, we must first desire to identify our options. Furthermore, beyond the brainstorm activity of listing one's choices in any given decision-making context, we must exercise skill in analyzing and evaluating the many alternatives in order to identify the best path to take. One's truth-seeking is displayed in this analysis and evaluation process as well in the extent to which the individual desires the "best" decision rather than the easiest or most expeditious decision or conclusion.

PF: Problem Framing. Weeks 5 and 8 present students with prompts designed to elicit from others the factors that determined how they framed a particular problem they were facing or had faced in the past. Week 5 requires students to evaluate the problem framing skills of their best friend, and Week 8 asks students to evaluate the problem framing skills of one of their professors. Problem framing, or in other words, problem identification, is one cognitive skill that is often underdeveloped. More frequently, instructors present problem-solving situations (essay prompts, lab experiments, out-of-class projects, examinations, etc.) where the parameters of the problem are fairly, if not completely, demarcated in advance. There is a reasonable amount of certainty that comes from this advanced staging, namely increased control of the problem-solving situation and increased certainty that the desired learning outcome will be experienced by the students.

The recent pedagogical trend of utilizing problem-based learning (PBL; Duch, Groh, & Allen, 2001) provides a teaching method that encourages students to direct their own learning process while working in collaborative groups to solve real-world problems. PBL is an effective strategy for developing students' thinking skills and motivating them to learn across disciplinary boundaries. *Through PBL students are practiced in the pre-problem-solving task of determining the nature of the problem, and the parameters of the problem-solving situation in addition to deriving an evidence-based solution.* In a similar vein, the Problem Framing prompts of the Reflective Log activity seek to build students' metacognitive awareness of this critical pre-problem-solving skill.

Role of the Instructor during the CT Reflective Log

It is optimal that the CT Reflective Log be introduced to students at the beginning of a course or program of study. It is particularly important that students are exposed to the online environment, know how to use the web-based bulletin board system being used for the exercise, and are comfortable with the software interface so they will be able to successfully post their reflections and reply to their peers. It is also important that students can ask questions about the CT Reflective Log activity. *Depending on cultural background, students sometimes need to hear a clear explanation of the importance of the exercise and the reason why they are being asked to evaluate the thinking represented in their own posts and that of their peers.*

I've found that students may not immediately feel confident in their ability to ask the weekly questions, especially if the task requires the student to be more intentional in their queries (i.e., the student might perhaps need to seek out interactions to pose the prompt to particular others). This potential was taken into consideration when the CT Reflective Log was developed. The weekly exercise starts with a question that is relatively easy to incorporate into everyday conversations – "Why do you think that?" The first target was similarly identified as a familiar "other" – a fellow student / peer. The weekly prompts gradually increase in challenge over the first few weeks to allow students to acclimate to the process. *It has been the experience of this author over the past ten years that by Week 4 students typically become quite engaged and enthusiastic about this exercise.* Frequently, students will display an eagerness and intentionality by actively seeking out multiple opportunities to pose the weekly question to see what quality of thinking responses they will receive

from different targets and what reactions they receive from their peer group when they make their online posts.

Instructors should thoroughly debrief each week's experiences, but only after students have had an opportunity to post their reflections and reply to their peers. It will be tempting for the instructor who is monitoring the online bulletin board to want to contribute to the discussion. Frank (2004) however suggests that instructors should resist joining as a regular participant in CMC discussions when student-centered learning is the primary goal. The peer group is intended to serve as the source of corrective feedback when a class member's post regarding his or her evaluation of the quality of the target's thinking is inaccurate or insufficiently reflective. *When the instructor is an active and regular participant in the online environment the quality and frequency of thoughtful peer feedback is negatively influenced.* The presence of the knowledgeable authority figure is, in this context, a detriment to peer-supported, student-centered learning. This is not to say that the instructor must let fallacious thinking and insufficient reflective practice go unnoticed. Instructors may wish to intercede by placing their own post in the bulletin board environment. This should be done sparingly and sporadically so as to avoid the anticipation of on-going instructor participation. To facilitate meta-cognitive reflection and the peer feedback process without interacting in the virtual environment, instructors can create a classroom climate that is welcoming of active discussion where self-reflections and peer reactions are encouraged. When necessary, it is in the context of the in-class discussion that the instructor can pose questions to the group that will encourage students to advance their thinking regarding examples being proffered for a given weekly prompt.

Thus, the primary role of the professor in guiding this activity to nurture critical thinking is to guide the debriefing discussion by asking students to offer a verbal description of her or his weekly post (the scenario and their evaluation of the quality of the target's reasoning) and to solicit comments from peers in response to the scenario the student is presenting. It has been my consistent experience that students require guidance in the argument analysis and evaluation process. For this assignment to be optimally effective in nurturing critical thinking, the instructor should use these in class debriefing sessions to discuss techniques of argument evaluation that include a consideration of argument *form* (structure and agreement), *content* (veracity and reliability of claims or conclusions being posited) and *context* (validity and appropriateness of the argument to the situation in which it is being offered).

Empirical Evaluation of Reflective Logs: Analysis of the Qualitative Data

Using the CT Reflective Log exercise in my classes for the past ten years has generated numerous examples of reflections and peer responses. I've done a qualitative analysis of these reflective examples to observe whether they would reveal a noticeable change in students' critical thinking and reflective practice over the ten-week academic term. The following two questions guided my evaluation of this assignment as to whether it *indeed* nurtured students' critical thinking and reflection: 1) what are the prominent features about the posts from each of the categorical prompt types? And 2) Do students demonstrate reflective practice in their posts or in their approach to this assignment?

As an attempt to answer these questions, I've included here an analysis of one group of students' prompts drawn from students' posts. There were seventeen students in this group. All seventeen gave posts worthy of quoting; only the most salient of which I've included here, along with my interpretation of their progress on the specified learning objectives.

Prominent features about posts from each of the thematic prompt types

EE: The Evaluation of Evidence. As mentioned above, students begin the journaling assignment in Week 2 by posing a question that is often perceived as one that is easy to incorporate into everyday conversation. For example, one student wrote "I really tried hard to incorporate this week's question into my conversations. It was good we started with an easy one so people wouldn't be that taken aback."

For the most part, students seemed to recognize the lack of supportive evidence as indicative of weak thinking. One student in her Week 2 reflection wrote, "This was weak thinking in my opinion because the claim that he made lacked any type of evidence". Another said, "She made her decision through speculation and didn't even stop to think about other

possibilities. She let her anger and emotions get the best of her.” Correlated to this was the recognition of the need to be open-minded when considering all relevant evidence in a situation. This is reflected in the following student’s response to Week 9 prompt: “I think this is weak thinking. To not take other points of view seriously or to consider all the effects a decision can have is not using critical thinking.”

However, there were a small number of instances where the students seemed to be forgiving of the fact that the speaker failed to support their position with evidence, and thus were less likely to deem the thinking as weak. This was a common occurrence in instances where the student felt that the speaker’s thinking was being “clouded” by emotions. This is evident in the following quote: “with relationships and feelings, I suppose that some things cannot always be explained.” Overall, out of the three categories of question prompts in the CT Reflective Log, the evaluation of evidence seemed to be executed with general ease by most of the students.

AC: Consideration of Alternatives / Consequences. Though not explicitly determined by the language of the prompt, the question for Week 4 was usually posed in relation to another’s career decision making. Interestingly, this question tended to be asked to the student’s parent or older sibling rather than an acquaintance or friend. In most cases the students in this sample reflected upon an impending career decision, namely whether to begin a teaching credential program the following year. In other words, it appears that they focus on the implications of a decision that needs to be made. Notice though that the wording of the prompt is not temporally bound. It is worth mentioning that students who complete this assignment in the spring quarter also focus on a career decision, but by the spring the decision has already been made, so they are reflecting on the implications of an already set decision.

The overwhelming consideration in determining thinking to be strong was whether the student felt they saw evidence of open-mindedness and thorough consideration of all possible alternatives during the decision-making process rather than logical strength. In her response to Week 4, one student wrote, “I think this was good thinking because she did not have her mind set all along but was open to different options until the one that felt right came along.” Another said: “He really considered many options and had legit [sic] reasons why he narrowed some down and went with others. I would call this strong thinking because he gave thought to what he had considered before he answered my question. He also had reasons why he did what he did.”

Students were more challenged by the task of evaluating their own thinking in terms of their consideration of alternatives and consequences. Responses to Week 6 where students were asked to reflect on the ramifications of a personal decision exhibited some students’ tendency to feel that the process of critical thinking is at times daunting, emotionally charged, and even overwhelming when the decision is deemed to be “high stakes” such as a career decision or relationship decision.

PF: Problem Framing. The discussion will be limited here to Week 8 as this was clearly the one prompt of the full set of nine that gave students the most challenge. In some cases, the students were unable to perform this action. Other students took advantage of situations where the question was posed to a professor by another individual. Still another student encountered a situation where it was the professor asking the question rhetorically to his class after the group had performed poorly on a quiz. When debriefing in class about students’ difficulty with this week’s prompts, students reported discomfort in what they felt was their implicit questioning of their instructor’s authority and expertise. This enabled the author to have a wonderful discussion of the role of authority and power in influencing human behavior and impacting the decision-making process. We discussed the forceful cognitive heuristic, the human tendency of deferring to or following perceived authoritative others when determining how to feel or how to act in a given situation.

An overall impression that comes from reading students’ posts for Week 8 is that they were surprised by the effect their questioning had on the professor’s behavior. One student wrote:

“I thought [my professor’s thinking] was strong because my professor gave me numerous reasons. I also believe this to be strong because she sifted through her notes in order to best answer my question and then she also told

me her own personal feelings on it. She was also then able to base what she said upon factual information and gave out specific statistics.”

Probably the most moving post for Week 8 came from a student who reflected that she was unable to complete the assignment as planned, but nonetheless still recognized the influence she had on her professor. She wrote:

“For this week's question I chickened out and asked one of my professors the question via e-mail and not in person; but at least it was asked. I e-mailed my political science teacher and asked her what exactly the problem was with giving women paid or longer maternity leave? After a day or so she e-mailed me back ... she said that she sees a "correlation between who makes the policies (heads of business and government tend to be men) and what they prioritize in business decisions." Then, she sent out an e-mail to the class forwarding an article that she found in the paper that day regarding this issue of women's pay in which it said women just don't negotiate for better pay. So, I would like to think my question sparked her to look for more information on this topic and then find the news article. The fact that she looked for more information on the topic makes me think she really thought about my question. Therefore, I would classify her thinking as strong because she gave me valid reasons and she did further investigating into the topic to back up her opinions.”

Many students conveyed observations in their posts for Week 8 that the question caused their professor to deviate from the preplanned lecture or discussion topic. In most cases, students were impressed by their professor's level of enthusiasm and knowledge about their discipline. Finally, students reported that the conversation in the classroom became considerably more “interesting” after they posed their question and launched the new class discussion focus. Perhaps one explanation for this experience is the fact that professors often omit the process and problem framing that went into something as grand as a disciplinary theorem or as seemingly mundane as the selection of lecture topics for any given class session. Professors rarely expose students to the thinking process that went into class session planning, but rather restrict presentation to the product of that thinking. Though not a direct goal in this assignment, it is evident from at least some of the prompts that students gained a sense of empowerment from the practice of asking thought provoking questions of their professors.

Do students demonstrate reflective practice in this assignment?

The other question guiding this effectiveness investigation focused directly on the issue of validity. The students' prompts were read with an eye for statements that were indicative of students' reflection. Two modes of reflection were identified. First, students gave examples of reflection during or after the posing of the weekly prompt. Sometimes the examples were of active reflection. One student wrote: “I wasn't even thinking about this class when this conversation happened, but as I reflected upon it after, I realized that it was a perfect example of weak thinking”. Other times the students supported their decision to label another's thinking as weak by stating that there was a lack of reflection. Consider the following quotes: “I think her thinking was weak because she did not take even a second to think about what I had said.” Or “I think that it displayed very weak thinking as he said only the most obvious thing and did not really consider it very much.”

The other mode of reflection came in the form of statements students gave to indicate that they were engaging in meta-cognitive reflection on the assignment. One student stated: “I didn't really ask her the question at the right time in the conversation, but I think it fit. Next time I will insert the question better.” Another, in response to a television commercial said:

“I think their reasoning is non-existent. I think my refusal to see the commercial as good advertising for their product is good thinking. It would be dumb of me to see [Brand] as a good choice in response to this commercial since they give no reasoning at all.”

A final way to evaluate whether the Reflective Log worked to increase students' meta-cognition and reflection was to examine the students' statements on what they learned about their thinking. Insights about the nature of critical thinking and one's personal skills and dispositions were evident in other students' Week 10 posts. Some of the insights on the nature of CT are reflected in the following quotes:

- I think being a good critical thinker is looking at all sides of the story and figuring out what would be the best solution from that point on.
- I've learned that being a good critical thinker does not always mean that I will find the right or wrong answer, but I know it will help me find the best solution. I'm sure there is more room for me to improve on becoming a better critical thinker, but this class has definitely provided a strong foundation for me.

Many students provided an assessment of their own thinking skills. Some students reflected that they did not consider themselves ones who thought well or often, whereas others recognized that they were strong thinkers, and that the assignment enabled them to be more assured in this self-assessment. This is evident in statements such as the following:

- I've come to the conclusion that I need to practice my critical thinking skills more often.
- I feel questioning other peoples [sic] thinking has really made me understand how little thought most people put into what they have to say, and this has in turn made me more aware of, not only what I choose to agree with, but also how thought out my own statements are.
- There have been times I've been trying to stretch my mind to explain certain things or evaluate thinking in this log and felt like my own thinking wasn't strong enough. However, on the flip side, I also noticed myself becoming more reflective. At my placement I was evaluating and judging every action to ensure that it was beneficial to the students. I was surprised to realize that I was constantly in a state of reflection in this case.
- I have realized the importance of critical thinking in the teaching profession. Reflecting is important to understand what went well or what didn't and why this is so.

Summary Comments to Guide our Future Research on Meta-Cognition

What are the reasons for the effectiveness of this CT Reflective Log assignment? I believe that a key element of this assignment that positively stimulates students' reflective practice is the asynchronous nature of the online environment. There is ample evidence that asynchronous CMC allows students to consider without constraint not only the discussion posted by their peers but their thoughts, feelings and reactions to the discussion before posting a reply (Andrusyszyn & Davie, 1997). Furthermore, the professor is able to interject into the asynchronous discussion in order to provide feedback and scaffolding (Angeli, Valanides & Bonk, 2003, Bullen, 1998; McLoughlin & Luca, 2000). Feedback in this assignment comes in the form of the occasional online corrective comment when a student was applying weak thinking or if thinking was absent, as well in class discussion that focus on improving students' thinking as well as praising examples of strong thinking skills or dispositions.

A unique feature of this assignment as a vehicle for nurturing reflective practice is that the content of the prompts is not based on a specific disciplinary subject matter or context, but rather focus on generalizable CT skills and dispositions. While the CT Reflective Log has been used exclusively in the context of the author's pre-service education courses, it is conceivable that this assignment could be modified to be used in other disciplines. Minnich (2003) argues that social communication is central to the development and active participating in critical thought. The CT Reflective Log serves this social communication

purpose, particularly because the vast majority of the weekly prompts are directed at others rather than self-reflection. It is also this idea of social communication that is given opportunity in the online CMC environment. While the examples in this chapter have focused thus far exclusively on the content of the original weekly posts of students, the replies to those posts can provide valuable information about the nature and degree of students' reflection and critical thinking that is possible through CMC.

More can be learned by examining the on-going communication that occurs as a result of this type of exercise. What follows is an example of a string of replies to an original post. This is typical of posts and replies throughout the nine-week assignment in the author's undergraduate courses.

Original Post for Week 10: I feel that this class has made me think critically about critical thinking; that is I learned to better evaluate my own thinking and others. In general, many of us are capable of critical thinking, but often times choose not to use these skills. I wonder why that is. Perhaps it's because it's tiring, or we don't really want to because we're scared of the conclusion or answer we may come to. I think that this is one of the most interesting aspects of critical thinking, simply when we choose to use it.

- REPLY #1: I totally agree. I think it will be interesting now that we are more aware of our own critical thinking to be able to see when we use it and when we don't!
- REPLY #2: Sometimes I think that's the hardest part of critical thinking. It's like when you know what's right for you, but you don't do it anyway because you're scared of the effect. REPLY #3: I see what you mean about people not using their critical thinking skills, even though they are capable of it. I actually see myself doing that a lot, but I think it's more because I like to keep things as simple as possible, even though that's not the way things usually end up. But imagine how life would be if we always thought critically about everything...
- REPLY #4: I am also really drawn to when people choose to use critical thinking. Can we stimulate this? Can we motivate this in others?

These exchanges give one a sense of the tone that is created, the habits that are nurtured, and the valuing of the assignment at the end of the ten-week term. What is most encouraging is that the replies to this assignment tended not to be based solely on the content of the original post. Instead, as can be seen above, the replies often times go on to give independent evaluations of the critical thinking evidence, suggest reflective and meta-cognitive activity, and as is the case in Reply #4, go on to pose new questions about pedagogy to enhance critical thinking. These dialogues clearly cannot be achieved through a hard copy journal or email journal that is submitted periodically to the instructor. In summary, this assignment works because it supports the students as they create a mutually supportive community of thinkers.

THE CRITICAL THINKING REFLECTIVE LOG

WHY: This exercise calls for you to write brief descriptions of *interesting experiences* with regard to thinking critically or scientifically. Meta-cognitive self-correction is the key to becoming a better thinker, and it is the reasoning behind this assignment. Rather than mindlessly repeating one's own errors of reasoning, or being misled by the errors of others, one is able, through meta-cognition, to reflect on one's own thinking. By applying critical thinking skills to the products of one's own critical thinking, one is able to analyze, interpret, explain, and evaluate one's thinking by the standards of good reasoning. One can, in fact, use one's own thinking to correct and to improve one's own thinking. This remarkable human mental ability, known as "meta-cognitive self-correction" is the real engine which drives an individual's and a collaborative team's growth in thinking. It is why

good thinking can be found in many people, even those who have not had the benefit of formal education. In some cases, its absence, even in those who have received many years of schooling or “scripted training,” is why persons fail to grow and mature as thinkers, and why their reasoning, regardless of their status or power, leaves so much to be desired.

HOW: The reflective log activity will begin in **WEEK 2 and will continue through WEEK 10**. Each week, students will post their weekly reflection response as a news item on our class electronic Bulletin Board. In preparation for your weekly post, take notice of the thinking demonstrated around you in relation to the weekly “reflection question”. You may find it useful to keep a written record in a notebook to facilitate your recollection. The process and progress of your interpretations, analyses, inferences, evaluations, and explanations will be manifest, albeit probably only in sketchy ways, in these preliminary notes. Since this log is about reflecting on thinking, those preliminary notes are valuable markers to you of the progress and development of your ideas. Each week, when your thinking becomes more developed, compose a **final paragraph** for that week. The week’s final paragraph must include your reflection and evaluation (strong or weak & why?) of the thinking involved in addition to the date and description of event or circumstance. This final paragraph should be added as a post to the Bulletin Board. **In addition, each student should COMMENT (reply) on at least two (2) classmates’ posts each week. We will discuss these “reflection questions of the week,” so come prepared!**

WHAT: Each week’s post must relate a striking experience regarding thinking critically or scientifically. What is striking for you might not be striking for someone else. It is YOUR experience and your reflection on it that this log is intended to record. Regrettably, the most fruitful learning experiences are often negative ones. In responding to the question for each week, you should strive to find experiences of weak, poor, flawed, fallacious, uncritical, or erroneous thinking. On the other hand, since it takes some familiarity with quality to appreciate and to seek excellence, some of the entries in the log must also be about strong, correct, high quality experiences that are striking to you because of how good the scientific or critical thinking was. Of the nine weekly entries, no more than three may be about good thinking. **The post for each week should evaluate (with supporting reasoning) the quality of thinking being discussed.**

Weekly Prompts for the Critical Thinking Reflective Log

Week 2: Why do you think that? (EE)	ASK: A student (or co-worker) not in this course
Week 3: How good is the evidence for that? (EE)	ASK: Anyone who is stating an opinion, not yourself
Week 4: What else did you consider? (AC)	ASK: Someone who has completed college
Week 5: Exactly why do you say that’s the problem? (PF)	ASK: Your best friend
Week 6: What does this decision imply? (AC)	ASK: Yourself
Week 7: How sound is the reason they’re giving? (EE)	ASK: Yourself, relative to TV commercial
Week 8: What’s really the problem here? (PF)	ASK: A professor
Week 9: What evidence would disconfirm our view? (EE)	ASK: Someone who agrees with you
Week 10: What did I learn about my own thinking?	ASK: Yourself

Week 11: What are the consequences of making this decision? (AC)	ASK: Yourself, at least once a day
Week 12: What's really the problem here? (PF)	ASK: Your field / practicum supervisor
Week 13: Are we correct in making this decision /policy? (AC)	ASK: Someone who shares with you the responsibility for making the decision
Week 14: What are the options / alternatives? (AC)	ASK: Yourself in relation to an important decision
Week 15: How strong is our thinking up to this point? (EE)	ASK: Others in a group decision-making moment

Note. The thematic type of each weekly prompt is indicated in parentheses. EE refers to Evaluating Evidence, AC refers to Alternatives / Consequences and PF refers to Problem Framing.

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Although the anthology from which this chapter is excerpted focuses on health science content, the techniques are highly transferrable to all types of training programs and educational projects.

Download other essays in this anthology by visiting Dr. Peter Facione's page at ResearchGate.com or Academia.com. For online professional development tools to build your reasoning skills and to boost thinking mindset, visit www.insightbasecamp.com For other valuable training techniques that focus student learning of reasoning skills and thinking mindset, see the other [Resources](#) on our Insight Assessment website.

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