

Critical Thinking Development Report

A Review of Current Best Practice, Research in
the Field and Selected Programs

Suzanne McAllister

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Introduction

The use of critical thinking methodology has become a major initiative in educational programs around the world. In both formal and informal systems, the ideal of educating students to become critical thinkers has been linked to citizens' successful participation in a democratic society. As it has become a focus within schools, the topic of teaching critical thinking has been subject to debate in several arenas. While most experts tend to agree that educating students to become independent thinkers who are capable of analyzing and solving complex problems, there has always been some academic disagreement about how to define the concept of critical thinking, how best to prepare students to perform it, and the validity of measuring the benefits of the entire process.

This report will briefly examine the history and central doctrines of the broader critical thinking movement. It will then provide an examination of how these concepts have been actualized in broad ranging methodologies, establishing a base of "traditional best practice." Further analysis of the current debates within the literature, specifically teacher preparation and training methods, technological innovations and the validity of current assessment methods will follow. A final section will provide an overview to current critical thinking initiatives in the international field, and an annotated analysis of five programs which currently use critical thinking methodologies innovatively in a variety of capacities.

Method

An extensive literature search was designed to identify and retrieve both meta-analyses pertaining to critical thinking pedagogy, and primary empirical studies. The databases searched

were ERIC, ProQuest Dissertations and Theses, Lexis/Nexis Academic, OPAC and Google Scholar Beta.

The descriptor “critical thinking” was used as a subject and key word. After reviewing the initial literature, the descriptors were broadened to widen the search focusing on pedagogical strategies noted in the literature. “Problem-based learning,” “inquiry learning,” “self-regulated learning,” “critical pedagogy,” “teaching methods,” and “assessment” were subsequently used in various combination with the original terms. The search produced records from 1960 through 2009 and was narrowed to limit redundancy. The research in this study thus focuses on studies published largely between 2000 and 2009. Emphasis was placed on collecting and analyzing literature from 2005 onwards, as 2005 was the most recent publication date of OSI’s *Teaching and Learning Strategies for the Thinking Classroom* manual. It is worth noting here that there exists a wide variety of literature in the English language, but that a fundamental limitation of this review is that only English-based articles and reports were accessible to the researcher.

Definitions of Critical Thinking in Education

While much value has been placed upon the cultivation of evaluation and thinking skills, critical thinking as a concept can be considered from multiple perspectives even within the field of education. A fundamental goal of the critical thinking movement within education has been to increase the ability of students to think rationally and reasonably about complex issues, to encourage their participation in democratic conversations, and to encourage the consideration of multiple perspectives in evaluating and analyzing arguments. It is generally agreed upon that critical thinking incorporates both skills and mindsets that are valuable in creating an informed and cognitively skilled citizenry.

Defining critical thinking as a concept, however, has been contentious from its beginnings. In 1991, Ennis posited a definition which has become widely accepted, that critical thinking is “reasonable reflective thinking focused on deciding what to believe or do.” (Baron & Sternberg, 1987) Paul broadened this definition to include associated dispositions of critical thinkers themselves as well as certain standards of intellectual thought which those thinkers should apply. (Paul, 1987) A separate approach to defining critical thinking exists within the field of cognitive psychology, which addresses critical thinking in relation to higher order thinking skills such as within Bloom’s taxonomy. In this view, critical thinking occupies the higher order planes of evaluation and synthesis, rather than the lower order skills of comprehension or knowledge recall. (Hofreiter, 2005) Still, scholars debate whether critical thinking can indeed be considered as a set of general skills and dispositions, or if it is too nebulous and broad for simple categorization. It seems that researchers cannot agree on whether it is the process and structure of thought, or the quality of the thinking. (Abrami, et al., 2008)

In 1990, a study sponsored by the American Philosophical Association attempted to summarize some of the conflicting viewpoints and establish a more tangible definition. Ennis, Paul and other experts in the field contributed to the study. The definition below was produced by the scholars in the study and serves as the most comprehensive and cited definition to date.

We understand critical thinking to be purposeful, self-regulatory judgment that results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based.

Critical thinking is essential as a tool of inquiry. As such, critical thinking is a liberating force in education and a powerful resource in one's personal and civic life. (Facione, 1990)

This study often referred to by researchers as the Delphi study, additionally identified six core skills that were believed to be associated with critical thinking (Interpretation, Analysis,

Evaluation, Inference, Explanation and Self-Regulation). Additionally, 16 sub skills and 19 dispositions were established to further define critical thinking abilities and behavior. These dispositions include such things as “inquisitiveness,” and “amenability to being well-informed.” (Facione, 1990)

Critical Thinking Skills and Dispositions

In planning educational activities around the goal of developing critical thinkers, it is necessary to determine what skills and mindsets are most desirable. While the six core skills laid out by the Delphi study remain the heart of most critical thinking programming, there exists a variety of additional skill sets which are found in educational literature. Scholars remain divided as to whether these are subject specific skills or whether they may be transferred between subjects. For the purpose of this review, sources were chosen that offered converging viewpoints. Below is a summary chart of the six Delphi core skills and a handful of selected skill sets from other sources for comparison. These additional sources highlight examples of how the Delphi skills could be applied in an educational setting.

Delphi Study	Halpern	Ten Dem	Pithers and Soden
Interpretation	Verbal Reasoning	Analyzing arguments	collecting, analyzing and organizing information;
Analysis	Argument Analysis	Judging the credibility of sources	Planning activities
Evaluation	Thinking as Hypothesis Testing	Asking clarifying/challenging questions	Problem solving
Inference	Likelihood and Uncertainty (evaluating predictability)		Communicating information
Explanation	Decision making and problem solving		Working with others
Self-Regulation			Using technology

[(Facione, 1990) (Halpern, 1998) (ten Dam, 2004) (Pithers & Soden, 2000)]

The core skills sets and their interpretations can be further broadened into more specific behaviors, or dimensions. This broadening, or rather, more explicit description of application can be helpful when defining exact aims for students. The following examples are from a list which Paul and his colleagues have developed in applying core critical thinking skills to learning situations. These strategies are broken down into three categories: affective strategies, macro-cognitive abilities, and micro-cognitive abilities. Examples are:

- S-13 Clarifying issues, conclusions or beliefs
- S-15 Developing criteria for evaluation
- S-19 Generating or assessing solutions
- S-23 Making interdisciplinary connections (Paul, 1987)

This list of strategies provides an interesting look into how the definition of critical thinking could be broken down into very relevant classroom structures. While none of the lists of skills, dispositions or strategies can truly be considered exhaustive because of the lack of agreement on the underlying definition of critical thinking, the list by Paul and associates stands out because of its educational applicability.

Until this point, this report has discussed strategies of critical thinking or critical thinkers. Beyond strategies and approaches to the concept of critical thinking, many experts agree that the definition itself is not complete without a set of defined behaviors that describe the ways in which critical thinkers approach topics. Various researchers have researched and written lists of such behaviors. In general, these lists converge around the quality of having openness to take multiple perspectives into account, the willingness to look for alternatives, the ability to suspend one's judgment, and the willingness to put effort into the thinking process. The following are the dispositions as defined within the Delphi report:

AFFECTIVE DISPOSITIONS OF CRITICAL THINKING

APPROACHES TO LIFE AND LIVING IN GENERAL:

Inquisitiveness with regard to a wide range of issues,

Concern to become and remain generally well-informed,
 Alertness to opportunities to use CT,
 Trust in the processes of reasoned inquiry,
 Self-confidence in one's own ability to reason,
 Open-mindedness regarding divergent world views,
 Flexibility in considering alternatives and opinions,
 Understanding of the opinions of other people,
 Fair-mindedness in appraising reasoning,
 Honesty in facing one's own biases, prejudices, stereotypes, egocentric or socio-centric tendencies,
 Prudence in suspending, making or altering judgments,
 Willingness to reconsider and revise views where honest reflection suggests that change is warranted.

APPROACHES TO SPECIFIC ISSUES, QUESTIONS OR PROBLEMS:

Clarity in stating the question or concern,
 Orderliness in working with complexity,
 Diligence in seeking relevant information,
 Reasonableness in selecting and applying criteria,
 Care in focusing attention on the concern at hand,
 Persistence though difficulties are encountered,
 Precision to the degree permitted by the subject and the circumstance.

(Facione, 1990)

The cultivation of these habits/behaviors is a major focus within the areas of literature which deal specifically with methodology. That is, while skills remain at the core of educational programming, many authors see these habits/behaviors as a necessary building block. Many of the empirical studies tend to assume that the acquisition or expression of one or more behaviors equates a learning activity with critical thinking methodology. Because the combination of skills and the behavioral expression of these skills remains undefined, assessment as to whether or not an activity promotes critical thinking, and whether the effect that it has upon a student's actual cognitive behavior, remains debatable.

Critical Thinking Pedagogy

Critical thinking best practice is closely coupled with several different methods, all of which seem to hinge around constructivist theory in which students take on the responsibility for creating their own knowledge. Because most of these are known to OSI already, this section will describe only the general techniques of the practices in connection to their theoretical

background. This is done for two purposes: to link the pedagogical strategy with the intended skill development, and to provide a framework for subsequent analysis of new innovations in the field.

The development of critical thinking skills within a formal or non-formal learning environment is dependent upon many variables. The skill of the teacher, prior knowledge of the content, previous experience in practicing critical thinking skills, one's personal learning style, and the classroom environment are just a few. Experts have debated whether the skill of critical thinking can be taught effectively as a stand-alone subject, or whether it is better delivered through more contextualized instruction within a specific domain. To date, no studies have conclusively argued the effectiveness of the stand-alone model [(ten Dam, 2004) (Tsui, A Review of Research on Critical Thinking, 1999)].

Despite this, a number of general practices have proven to be effective no matter the context in which they are applied. In a review of literature on effective critical thinking practices at different universities, Tsui concluded that improvement in critical thinking ability was related to courses which offered students the opportunity to create knowledge through social or interactive structures, and which emphasized higher order thinking skills. Assignments such as presentations and essay exams were also effective, as was critical feedback from instructors. In this study, as in others, the level of peer to peer interaction also showed a correlation to increases in critical thinking ability. (Tsui, 2002)

Pedagogy and Relevance for Students

Beyond motivating students, skills and projects which have relevance for real world application tend to be easier when students transfer them between subjects. When teachers allow control of the content to be driven by the students, it is often termed self-directed learning. These

projects seek to give students the opportunity to explore social realities and allow them the chance to test out assumptions. In one study, Hawkins evaluated a group of multicultural urban students in her writing class. The students were asked to begin with an experience in which they felt discriminated against, and make an assumption about what had happened. Then they were asked to critically reflect on it and research the nature of the issues. Finally, the students concluded whether or not their initial assumption was supported, based on what they had learned. Though it seems like a very intense experience and content can vary wildly between students' choices, the instructor noted that participation and motivation were high, and the success of a secondary goal – to address community problems in a classroom setting, was reached. This indicates achievement of some of the associated critical thinking behaviors – motivation and participation in investigations, as well as orientation towards the skill based self-regulation.

Pedagogy and Good Thinking vs. Bad Thinking

As these behaviors are applied to students and their achievement, the argument over promoting good habits and thereby good thinking, becomes central. “It is implied that ‘good thinking’ in any area involves being able to identify questions worth pursuing, being able to pursue one’s questions through self-directed search and interrogation of knowledge, a sense that knowledge is contestable and being able to present evidence to support one’s arguments.” (Pithers & Soden, 2000). Good thinking habits do not simply supplant old ones, however. In a study which focused on the behaviors of students and teachers as related to critical thinking pedagogy, Pithers and Soden reported on a number of thinking habits that teachers could try to in order to remove obstacles which prohibit students from achieving this state of thinking. The habits that were identified as unfavorable to the development of critical thinking involve:

...learners who: (1) act without thinking (impulsive); (2) need help at each step (over-dependent); (3) use goal-incompatible strategies (do not perceive cause–

effect relationships); (4) have difficulty with comprehension (miss meaning); (5) are convinced of the 'rightness' of their beliefs (dogmatism); (6) operate within narrow rule sets (rigidity/inflexibility); (7) are fearful (not confident); and (8) condemn good thinking as a waste of time (anti-intellectual). (Pithers & Soden, 2000)

This research additionally contends that there are several teacher behaviors which are incompatible in helping students improve their critical thinking. These included teachers whose responses were merely to agree or disagree, teachers who simply lectured or demonstrated, teachers who did not allow students to finish responses, teachers who only used questions that probed basic recall facts, or those who rebuked students' attempts at learning new material. These behaviors tend to discourage students from interacting in new ways with new material.

The authors suggest that teachers can encourage students to develop new thinking habits and replace the old by expressing their interpretations, observing, critiquing, evaluating, designing their own experiments, identifying their own and others' assumptions, gathering and organizing information, and applying their learning to new situations. (Pithers & Soden, 2000)

Evaluating Assumptions

The method of encouraging critical thinking by having students question assumptions is prevalent throughout the literature. Van Gelder terms this the "valuing of epistemologies," and notes that getting anyone to consider and change his or her viewpoint is very difficult because of the innate human tendency of each to preserve his or her own belief. "At root, belief preservation is the tendency to make evidence subservient to belief, rather than the other way around." (Van Gelder) That is, students will generally look for evidence to justify what they already think they know. Inspiring learners to think critically and to evaluate their own perspectives thus requires the ability to look critically at the evidence supporting and opposing various perspectives. Van Gelder suggests the tactic of concept mapping here, as it is a way to visualize arguments and

allow for engagement between individuals. Additionally, it helps to make the arguments and thinking process of the students tangible for the instructor, thus sharing the ideas in a broader spectrum. In this structure, learners use graphic organizers to highlight their ideas and share with others to engage in dialogue. [A related development here is the relatively new Austhink software, developed by Van Gelder and used in Australia/Australasia to help promote critical thinking in language activities www.austhink.org]

Experiential Learning

Experiential learning refers to teaching methods which incorporate student experience and choice in developing the content and material. Learning situations involving experiential learning tend to help students connect personally with the material, and thus begin to conceptualize new models by comparing them with old. Within critical thinking theory, this is crucial for interpretation of perspectives, self-regulation and motivation.

Experiential learning is described well in a 2002 case study of AIDS education with youth in Uganda. In changing the program from its roots as a state-offered curriculum to be more effective in helping students to think critically about choices regarding sexual behavior, the author augmented the curriculum to allow for student input. By allowing the individual concerns of students to drive the focus of study, the resulting curriculum addressed more than the original. The new curriculum focused on the intersections of the state mandated curriculum as well as the concepts which students felt most interested in or skeptical about. While it is difficult for many teachers to relinquish their role of authority within the classroom, the author reports that this was the most effective way to allow students to create their own knowledge. The delivery of the revised curriculum was thus democratic and participatory in nature, and because of this structure it was found to increase the responsiveness to the AIDS curriculum. (Mirembe, 2002) This

provided students with an opportunity to reflect more critically on their personal choices, which essentially works toward three of the six corps Delphi skills of analysis, evaluation and self-regulation.

Collaborative Learning

Interactive learning is another structure which is often used in developing critical thinking skills, because the structures emphasize many of the behaviors which are seen to promote good thinking habits. Johnson and Johnson describe the prerequisite conditions necessary for student interactions to inspire collaborative learning and thus critical thinking, rather than just group learning. First, the goal of the discourse must be collaborative, not competitive, in order to ensure the best transfer of information. Second, the student groupings should be heterogeneous where possible, to encourage difference of opinion and alternative perspectives. Third, the students must be able to ask for and share information as this correlates strongly to their ability to problem solve. Fourth students must be able to disagree with one another without creating conflict. Finally, the students must be able to engage in “rational argument” which essentially is fact and evidence based. (Johnson & Johnson, 1993) When these conditions have been established, the stage is set for broader collaborative and critical work.

Johnson and Johnson designed a collaborative classroom structure called “Creative Controversy,” and stipulated that divergent, rather than convergent thinking was the goal in promoting critical thinking. In this view, students are required to research and argue a perspective from one side, later advocating from the opposite perspective. After having promoted both/all sides, students are required to drop their given perspective and work towards a solution from any angle, attempting in the process to base their decisions on evidence. Studies found that this type of interaction was more likely to develop epistemic curiosity in the students, leading

them to question more as they learned more, rather than become comfortable with singular perspectives. In comparison with debate and other structures, the creative controversy structure helped students apply concepts to new situations with greater accuracy. (Johnson & Johnson, 1993)

Johnson and Johnson also stipulated structures which are essential for collaborative activity to have an effective influence on students' general cognitive skills. These structural characteristics are positive interdependence, face-to-face interaction, individual accountability, interpersonal and small group skills, and group process. (Baloche & Platt, 1993) Spencer Kagan, a prominent author and designer of collaborative structures that can be implemented across disciplines later described a similar set of conditions in his acronym PIES: Positive interdependence, Individual Accountability, Equal Participation and Simultaneous interaction. (Kagan & High, 2002) The above conditions serve as prerequisites for constructive dialogue and social interaction – two major prerequisite methods for teaching critical thinking skills. Yet, it is important also to note that activities which simply fill these conditions do not always impart critical thinking skills.

Peer to peer interaction is extremely important in creating a learning environment that is conducive to teaching critical thinking, both from the theoretical standpoint that learners create their own knowledge through discussion and social engagement, but also from an active learning perspective which highlights the notion that students learn best when they are engaged in participation. (Cook, 2008) Discussion has long been a structure which is used to push critical thinking development. Cook outlines three types of discourse among students in such interactions. Cumulative talk refers to the act of building on one another's ideas and is the most common type of communication found in classroom conversation. Disputational talk occurs

when a student tries to promote his or her own idea without taking the ideas of others into account. Exploratory talk involves the active consideration of multiple perspectives. Cook proposes that exploratory talk does not always happen naturally in the classroom, but can be facilitated by an instructor. Further, exploratory talk is the standard toward which critical thinking instruction should push, as it requires learners to think and consider different points of view. This is difficult of course because most students tend to move toward a point of convergence in their dialogue. (Cook, 2008) As suggested earlier, a possible method to counteract this is to use creative controversy principles which require students to advocate from different points of view and to do so in a non-competitive atmosphere.

One final social structure which supports critical thinking is that of oral presentation and debate. In a study of self-reported student experience in universities, Dundes found that a major gap of their education preparation was the absence of oral presentations. Oral presentations, like argumentation, have been promoted by researchers as a critical thinking structure because of the information synthesis stage which learners apply when they are constructing their lecture for the group. (Van Gelder) This structure has a major drawback however, because only one student may be active at a time. To augment this, Dundes suggests debate as a possible remedy in that it keeps more students active (either in speaking or listening). She contends that though debate has a competitive nature, it is a more active form of interaction than an oral presentation, and that it has the potential to maximize interpersonal interaction. (Dundes, 2001)

Writing as a Method

Nowhere in the literature is a method more promoted to aid in critical thinking than writing. Researchers have suggested and evaluated numerous ways to use writing in the classroom, the most frequent being informal written processes, such as journals. It is also

important that within the writing process, the student receives timely feedback which he or she may then reflect upon and incorporate into his or her next piece or draft. Malcom indicates that such programs as *Writing Across the Curriculum* and *Writing in the Discipline* are both centered upon the idea that writing promotes thinking skills. In her study, she used news analysis with her university sociology class to link theoretical course content with current events. She argues that the act of writing forces students to make sense of complex issues and additionally forges a connection between the theoretical course concepts and the real world. In the class, students choose a current even and trace the threads of course concepts within it, arguing for one possible theoretical explanation of the event. Afterwards, they are expected to find a “point of divergence” -- evidence about the two subjects that do not support the earlier conclusion. Malcom reports that while this is the most difficult step for the students, it is also the most powerful one because it requires the critical self-awareness that is only possible when one steps outside his or her experience. As the students seek to construct their knowledge and opinion about the subject matter they are quickly asked to construct an opposite or additional explanation. (Malcom, 2006) Malcom notes the method is adaptable and could be used for various sources beyond news articles. She suggests comic strips as well as song lyrics and encourages the regular use of such strategies that involve writing in developing students’ critical thinking skills.

Dialogical Reading

While writing strategies address the portion of learning concerned with synthesis and application, reading strategies often address the skill of organizing information and evaluating arguments. Yet, studies of students from elementary level through university age show that students do not usually evaluate the truthfulness of their reading material. (Commeyras, 1993)

Instead, much is taken verbatim. Several authors highlight the fact that in today's world of increased communication flow and the increased availability of non-scholarly published material (i.e. Wikipedia), the skill of evaluative reading is becoming increasingly important. One strategy that has emerged in the past is termed Dialogical Reading, and is used to help learners think critically while in the process of reading. In general DR follows the pattern of reading a passage, making hypotheses, socially sharing a preference for the outcome, discussing personal assumptions, then returning to the text for evidence to support various arguments. After further reading and discussion, readers consider the information and find reasons to support interpretations. Finally, they evaluate the acceptability and relevance of different perspectives. This is typically done in guided or small groups. Dialogical reading has certain advantages, such as that struggling readers are more able to keep up with the material because of the social dialogue which encourages their participation. Because readers are asked to consider multiple perspectives and ultimately justify the relevance of different choices via text proof, they are engaging in rational argumentation and social construction of knowledge. (Pohl)

Content-specific Methods

Substantive consensus of critical thinking best practice is lacking within the scientific and social science fields. General consensus within the research, however, highlights the need to bolster science and social studies by introducing a variety of perspectives and engaging students in dialogue in which they construct their own understanding of competing perspectives. Specifically, the use of primary sources, art and media analysis is reviewed positively.

Pappas argues that primary sources are essential to developing critical thinking within any genre because they give a more personal view of the elements of history and additionally may allow students to connect with personal experience more easily. Of utmost importance is the

use of these sources, often competing accounts, in helping students establish truths. Pappas suggests using discussion to allow students the opportunity to make sense of the how and why of the events, without the teacher participating as an authority – in this manner, authentic knowledge is created from the students' own understandings. This can be done via small group work focusing on essential questions. (Pappas, 2006)

When used for critical reflection, researchers have found that discussing art provides potent ground for creation of knowledge and argumentation of perspective. Comparing it to the scientific method, White adds that it can be additionally powerful when a final step requires students to evaluate the strength of their conclusion. (White & Robinson, 2001)

Michael Berumen finds a similar opportunity to construct knowledge in the field of science in terms of establishing truth by considering claims made by popular movies. He suggests that within films' like "A Bug's Life," or "Finding Nemo," there are fascinating scientific statements that sometimes are highly educational and sometimes miss the point. Through essential questioning, discussion and research, students have the opportunity to question and evaluate a film's claims [such as "do fish really lose their memory?"], create their own knowledge and apply it to personal situations – in this case their favorite cartoon films. This supports both social constructivist theory and building a personal connection to the material.

Role of the Instructor

Successful implementation of peer to peer dialogue, inter-group discussion and many of the above techniques requires not just active participation from the students, but also a quality of teaching in which the teacher feels comfortable in the role of facilitator and is capable of asking high quality questions. Studies note that the ability to take on these roles and release control often is a roadblock to proper critical thinking instruction.

An additional obstacle in implementing critical thinking instruction is the existence of beliefs which run counter to divergent thinking. This is what Pithers and Soden call the 90-90 principle. This is the idea in which teachers drive students to achieve the correct answer, and thus be 90% correct, 90% of the time. (Pithers & Soden, 2000) Pushing students toward the attainment of one correct answer or a certain set of knowledge, is the antithesis of critical thinking programming, because it limits the multiplicity of perspective, and thus the authors argue for a change in values among educators.

Current Academic Debates in Critical Thinking

The academic community has moved on from the standard debate of whether or not to include explicit critical thinking instruction, and tends now to be more focused on what the traditional methods are actually achieving in the classroom. Much of the literature is grounded in proving or disproving the effectiveness of commonly used practices. Particular arguments center on the best methods to prepare teachers for critical thinking instruction, the role of the internet and online discussion in promoting or inhibiting critical thinking, and testing validity in assessing growth in critical thinking.

Issues in Teacher Training

Teacher Belief Systems, Mentors and Skill Development

Most researchers agree that teaching critical thinking skills effectively is an advanced instructional skill. In many cases, the methods considered best practice typically involve lots of peer to peer interaction and student directed learning. For teachers who are unaccustomed, even to having experienced this form of learning from their own student perspective, it is difficult to implement the classroom management structures that will lead to more collaborative learning.

The debate over whether or not to include critical thinking teaching strategies into teacher preparation programs has advocates on both sides. As a movement within the United States, education of teachers has consistently moved towards inquiry oriented practice. (Tegano, 2005) Many experts feel, however, that teaching critical thinking is a skill of mastery and cannot be properly taught to teachers until they have sufficient experience within the classroom to implement the structures properly. Others take issue with this perspective, arguing that learning to teach critical thinking involves a change in mindset at the most basic level– that is, the teachers themselves must experience transformative learning in order to feel comfortable relinquishing the traditional authoritarian teacher role. Tegano finds that structuring teacher training with such methods as collaborative grouping helps new teachers make this transition effectively. (Tegano, 2005)

In researching a way in which student teachers could be taught to take on self-regulated learning instruction, Perry et. al reports that teachers typically experience three stages during their early teaching years. The first is of survival – they are concerned with their ability to do their job and the most essential tasks that must be completed. The second stage shows the teachers developing a greater interest in what they are teaching through more clearly articulated goals. In the third and final stage, teachers generally become more focused on their students and how they can better instruct to the pupils’ needs. (Perry, Phillips, & Hutchinson, 2006) In this study, the authors experimented with the possibility of using mentors to aid student teachers in the planning and delivery of self-regulated learning lessons that they might reach this advanced level of instruction earlier. Results showed that there was a modest relationship between the ability of the mentor teacher to structure self-regulated learning opportunities and the ability of the new teacher to do so. (Perry, Phillips, & Hutchinson, 2006)

Tegano argues that beginning teachers can and must be exposed to the cycles of reflective learning that they will later use in their classrooms in order to fully understand the practice. She suggests that teacher education programs invest their candidates in cycles of inquiry so that they know to situate the need to inquire within their classrooms. In this study, teacher candidates were engaged in observation, reflection, planning and evaluation of classroom practices. In addition, candidates were asked to step back from their actions to think critically about events that had happened and construct their knowledge of the classroom. This type of reflective practice requires teachers to discuss and document their experience and those of their students within the classroom. When done in collaboration, teacher groups inspire the formation of critical relationships which new teachers can use to help maintain the consistency of their experiences. (Tegano, 2005)

To incorporate multiple perspectives into teacher training, Tegano suggests structures which focus teachers on observation, documentation, reflection, analysis and planning within a collaborative atmosphere. Recognizing that learning to inquire is a difficult process, she also suggests the development (through collaborative work) of critical thought partners. Snyder also recommends this process of work-based learning. (Snyder & Snyder, 2008) Both Lambe and Yeh find that this process of experiential/transformational learning for the teachers (i.e. practicing what you preach) can be taught effectively in an online environment. [(Lambe, 2007) (Yeh)]

As teachers progress from novice to advanced, there are other aspects involved in their ability to teach critical thinking. Foremost among those is the aspect of belief systems. “Students preparing to become teachers enter their courses with strongly entrenched biases.” (Pierce & Kalkman, 2003) While many teachers come to the profession agreeing that a certain concept such as critical thinking is highly beneficial to their students, the reality is that their action within

the classroom may not show that. In their study on teacher belief systems, Pierce and Kalkman found that teachers generally do not have a learner-centered concept of teaching and suggest therefore incorporating critical thinking activities into the teacher preparation process. This serves two functions – both to break down and examine the belief systems of the teachers in a visible way, and additionally to help them experience student-centered learning structures first hand.

Bouton thus recommends examining teacher belief systems which can help to explain these behaviors. In researching this aspect, she found that teachers struggled with the role of a facilitator most often when they felt overwhelmed by the amount of material that they had to cover. Teachers were more likely to revert to standard lecture procedures when they felt that their students were unprepared, they felt as though the time frame was not enough to cover the material allotted, or the administration of the school did not seem to openly value critical thinking instruction. (Bouton, 2008)

Online Learning Platforms and Critical Thinking

Increased access to the internet has implications for teacher education as well as for critical thinking instruction. Lapdat contends that discussion platforms can serve as an increased opportunities for dialogue in which new perspectives and voice can work together to construct meaning. (Lapdat, 2000) In an online environment, teachers can easily step out of the role of authority and encourage dialogue between students. Due to the asynchronous nature of bulletin board type courses, students have ample opportunity to think over and respond to postings when and where it is convenient for them, therefore theoretically increasing the possibility of higher order thinking level dialogue because of the ease with which they can engage. (Cheong & Cheung, 2008) (Yang, Newby, & Bill, 2005)

“Electronic discussion provides a natural framework for teaching critical thinking because it captures the best of both traditional writing assignments as well as in-class discussions.” (Greenlaw & DeLoach, 2003) The act of writing, as shown before, provides the opportunity for sharing perspective and within an online community the opportunity for evaluation and discussion of different perspectives is increased.

Many studies have thus attempted to determine whether online discussions constitute collaborative learning and in turn if these do produce positive results in student critical thinking abilities. Nussbaum suggests that online learning provides deeper thinking opportunities because of the increased opportunity for social interaction (discourse) and the increased exposure to ideas from peers. In addition, he found greater opportunity in which students could provide arguments and counterarguments to one another. This was countered by several researchers who found that online discussions tended to be shallow in the depth of material and lack of advanced thought expression, and students often repeated what others said without taking the discussion further [Cumulative Talk]. (Cook, 2008) Results from studies addressing these issues on online discussion courses are inconclusive when applied to discreet critical thinking skills. Additionally, there is no standardized assessment for measuring critical thinking improvements in online courses, thus challenging the validity of research claims. Nevertheless, the plethora of studies suggesting different strategies which may constitute best practice has emergent themes in several different areas, thus warranting a closer look.

Strategies to Promote CT in Online Discussion Forums

Several studies investigated methods within the online program delivery to examine their effectiveness. In a study by Yang et. al, the use of online Socratic questioning was found to increase the critical thinking skills of participants. Students in the class additionally showed

lasting improvement in CT skills even after exposure. To achieve this, students first completed readings and posted opinions on a topic with evidence to support their ideas. Additionally, they were required to comment on one another's submissions. Instructors responded to postings promptly and with questions. These questions were designed to probe for clarification or to enlighten students about their assumptions. The study also recommends that the courses should explicitly teach Socratic questioning to the students so that they too may employ it in online forums. This call for explicit face to face critical thinking instruction is found throughout the literature. (Yang, Newby, & Bill, 2005) (Lambe, 2007) (Cheong & Cheung, 2008) Yang et al additionally found explicit modeling of the Socratic technique was successful in increasing the higher order thinking skills of students.

The expectations of the course and the topic for discussion must be also be carefully designed, otherwise the likelihood that students will participate without gaining critical thinking skills is quite high. Cheong and Cheong make general recommendations for better participation in such courses, such as having required posting dates and marking student frequently. Studies have shown however, that without prior instruction on argumentation, students will also not gain much from the experience. (Greenlaw & DeLoach, 2003)

Whether or not online discussions may be considered collaborative learning has been debatable because the forum lacks the face to face component of an in-class dialogue. In a comparison between an online forum and a face to face course, a study by Maurittinen in 2001 found that argumentation skills develop for both groups, but with slightly different foci. Those who participated in an email and internet course showed improvements in identifying and choosing relevant grounds to support their arguments. Those who participated in the face to face dialogues improved in the skill of counter-argumentation. (Marttunen & Laurinen, 2001)

Several studies call for the explicit coaching and mentoring of students as they develop critical questioning and reflection skills. Yang et. al addresses this in a 2008 study on the applicability of online discussion forums in promoting CT skills in large university courses. The method explored here was to train the Teaching Assistants and the instructor explicitly in Socratic questioning techniques. The main task of the assistants was to probe the students' thinking and to enable them to question their own assumptions in online postings. Following assessment, Yang concluded that mentors who were trained explicitly in Socratic questioning skills could raise the CT skill level of online discussion participants through taking an "inspired" role in teaching and by modeling and prompting Socratic dialogues. (Yang Y.-T. C., 2007) This study supports the general theme within the literature that in order for an online forum to be effective in developing critical thinking skills, the discussions must be carefully moderated and the desired thinking skills must be explicitly taught and practiced within the dialogue threads.

WWW and Computer As Mentor

The use of the internet as a tool in teaching critical thinking builds upon the method of incorporating primary sources into student-centered discussions in order to provide opportunities for knowledge to be authentically constructed. With greater access to information, and increased availability of sources with questionable truthfulness, critical thinking is both the desired process in working with the internet, as well as the end goal. Students must become cautious consumers of information and they must therefore have the evaluative skills to read critically in evaluating source bias. Buffington describes a recent trend in which educators use the web as a tool for evaluating bias in different sources. She argues against this method, as she finds it again to be akin to the model of convergent thinking. Instead, she recommends a practice of using internet sources as a launching point for divergent conversation. She recommends incorporating the

strategy of discussing contemporary controversies, such as the repatriation of stolen art artifacts from the Nazi-era, where students are likely to come across many different opinions. From there she recommends building projects which seek to integrate students' new understanding.

(Buffington, 2007)

Within the arena of best practice and technology lies the question of whether the computer can be used effectively as a guide. Though discounted in online forums, some studies are touting the ability of the computer to function as a quasi-mentor in scaffolding type exercises. Ali describes this method in terms of providing assistance to learners who, without the aid, would not be otherwise capable of performing the task. Providing assistance through a computer has the advantage of being completely personalized and additionally may constitute active-learning because the learner is engaged the entire time. Learners acquire immediate assistance and, in an ideal situation, support which is matched exactly to their learning needs. Ali argues that this method falls into constructivist theory because it allows students to interact with new material while simultaneously assessing how it fits into their old conceptual view. (Ali, 2005)

Additional computer assisted programming developments include the advent of more powerful visual mapping software. These programs, which primarily build on concept maps, can be used effectively to help students organize or evaluate arguments. This can aid both teachers and students in documenting the thought process and in making the train of thought visible. Proponents of this method argue that the learner strategies here can be completely problem-based and are easily applicable to collaborative situations within classrooms. They maintain that mapping activities can be done without instructor-centered practice and that this further justifies the active learning model. (Van Gelder) (Elsegood, 2007)

New Studies about Old Methods: Writing and Reading

The majority of recent literature in the field of critical thinking education has to do with the effectiveness of methods that have been introduced in the past. Studies evaluate their effectiveness, and articles highlight their applicability. This section will highlight important justifications in the field and will additionally look closely at new variations which have proven successful, at least in self-reported studies.

“Despite the widely professed centrality of critical thinking development to the educational enterprise, much uncertainty exists as to how educators can most effectively foster this valuable skill.” (Tsui, 1999) Tsui maintains that in the majority of studies which occupy the bulk of literature on critical thinking in education, the data tends to be self-reported and qualitative. Additionally, there are many studies which address the same teaching elements but draw conflicting conclusions. Overall, little empirical evidence is available to support one methodology over another. Thus, it isn’t surprising that in the ten years since the publication of her study on best practice, the field has been active in proving and re-proving standard and controversial methods.

One of these standard methods, as addressed earlier, is writing in its various formal and informal structures. Tsui found that schools which demanded more writing simply scored better on critical thinking assessments. This was clear at schools in which instructors incorporated writing across the disciplines (Tsui, 2002) While innovation and new methods are necessary, studies on writing support the notion that teachers must make better progress in letting go of practices which are ineffective, such as multiple choice tests. Dunlap builds on this to examine current best practice in the field, highlighting that rewriting is the key to engaging students in thinking about their own learning process. Reflective writing is at the heart of the literature at the moment because it encourages reflective thinking and supports the development of skills which

can be transferred across domains. Writing additionally may help to make conceptual ideas become more visible and in that way can drive discussion and dialogue forward. (Dunlap, 2006) Dunlop thus recommends giving cues to help students focus their written responses, and structuring writing tasks to connect with the actual activity they are doing (rather than teaching it as a stand-alone topic).

Emergent themes in reading education highlight the use of small group learning and reflection. Penningroth et. al argues that creating opportunities to apply what has been read may lead to gains in critical thinking. Although this is not a new concept, the idea of content-loading before or parallel to a course of study is contradicted by Duron et. al who contends that “While it is useful for students to gain some exposure to the material through pre-class readings and overview lectures, students really do not understand it until they actively do something with it and reflect on the meaning of what they are doing.” (Duron, Limbach, & Waugh, 2006) This study thus advocates letting go of frontloading approaches which require great amounts of reading before engaging in activity.

Experiential and Problem-Based Learning

Neither experiential learning as a method nor civic education which promotes the precepts of democracy are new concepts in education. However, in the literature there was only one appearance of the two coupled in a positive learning activity. Reporting on her experience as a teacher educator in Bosnia in 2008, Suzanne Krogh describes methods used to help move children towards an understanding of democracy. In these activities, students studied various concepts of democracy focusing on democratic leadership, good qualities of a leader and the possibility of removing the leader if he or she betrayed the trust of the voters. Concurrent to learning the conceptual material, students were engaged in a political activity in the class which

invited them to elect leaders to represent them as students. In comparison with a control group, these students gained an understanding of democracy that was firmly rooted in personal experience and enabled them to think critically about the leadership qualities within their classroom. (Krogh, 2008)

Problem based learning continues to be a favorite topic within the field of critical thinking education in terms of how teachers approach the strategy and in tracking its increased appearance in online learning assignments. Described as “any learning environment where the problem drives the learning,” problem-based learning [PBL] is not actualized as often as other methods because it requires a fundamental revolution of teaching style for most educators. (Kenney, 2008) Because the essence of the exercise is for students to pool knowledge and fill in existing gaps by researching information, teachers are essentially left out of their traditional role as the information authority. Additionally, teachers struggle to find time for students to learn enough of the content because class time continually is segmented into ever shorter chunks. With the increase in block time scheduling, teachers are often left with 45-50 minute chunks which make it difficult to allow students enough time to investigate. Suggestions in moving PBL forward include giving the assignments real-world relevance. Kenney suggests taking a “one-shot PBL” approach in which students grapple with the problem, but within a realistic time constraint such as drafting a press release to be aired in 40 minutes. (Kenney, 2008) Other researchers contend that a time limited scope prohibits true inquiry and thus the development of critical reflection.

Other authors feel that PBL alone is not enough to promote critical thinking. In a 2006 study on the relationship between problem based activity and student learning, Cianciolo et. al found that while students exhibited more inquiry behavior, this activity alone does not guarantee

development in critical thinking. Instead, a connection was noticed between the ability of the educator and the results of the students. (Cianciolo, Flory, & Atwell, 2006) Another study in which PBL was incorporated into the online learning environment also failed to make a direct connection to critical thinking was done in an online forum in Turkey. In this study students were engaged in an online course which involved email correspondence. While the author felt that students did not take full advantage of the online opportunity for dialogue, she states that there was however, an increase in motivation to learn as well as an increase in exhibited inquiry behaviors. (Kurubacak, 2005) A later study by Sungur in 2006 found that there was a positive correlation between PBL methods and the intrinsic goal orientation, effort regulation and meta-cognitive self regulation of students. (Sungur & Tekkaya, 2006) This is relevant because other studies have shown that these qualities of self-regulation and motivation are more likely to continue to engage in an activity even when it proves difficult. These skills of self-regulation and motivation to inquire are additionally listed earlier in this report as behaviors which are favorable to the development of critical thinking.

Shamir highlights the relationship between critical thinking and peer tutoring in his study on the use of multimedia technology in peer coaching. Through an investigation that covered both the influence of peer coaching as well as the introduction of computer use, Shamir found a positive correlation between the amount of higher order thinking and the amount of communication between students. Nonetheless, explicit instruction must still be given in developing peer tutoring competencies which lend to critical dialogue and reflection. (Shamir, 2008)

A more recent project involving inquiry based learning has taken place at Seattle University. Since 1997 all of the Biochemistry courses have been lecture free, with resulting

increases in critical thinking. The project, called Process Oriented Guided Inquiry Learning [POGIL], is an initiative which incorporates a learning cycle paradigm including exploration, concept invention and application. Assignments are carefully structured to connect previous knowledge with new concepts in new contexts. Collaborative learning is a big focus within classes and critical process skills are covered as well. The school reports that many students struggle with the active learning format at first and for this reason they incorporate a “words of wisdom” set of readings which have been designed by former students to help the new ones adjust. In a series of self-reported evaluations, the school has seen positive growth in overall critical thinking among the students. (Minderhout & Loertscher, 2007)

Another recent application of the problem-based learning approach has been the incorporation of service learning into the planning. Traditionally, the problem design stems from curricular material and may not connect fully to students’ prior knowledge. Additionally, if done poorly, students may not become aware of how they learn. Quidatamo reports on a method which uses community-based service-learning to improve students’ critical thinking abilities in science. In it, students are responsible for developing and carrying out localized experiments. He contends that because they are learning from a perspective of relevancy, they are able to reflect and improve in ways which increase their self-awareness. (Quitadamo, Faiola, Johnson, & Kurtz, 2008)

Despite the propensity of research regarding the benefits of writing, it still remains a debatable topic in terms of its relationship with critical thinking development. A study by Quidatamo showed a strong relationship between improved CT skills from students who wrote considerably more than a control group. Specific increases were measured in inference and analysis ability and some minor improvements were made in evaluation skills. There were

variables, however, which could not be accounted for such as prior experience with critical thinking lessons and the gender of the participants. (Quidatamo, 2007) Gammill additionally notes that in both the *Writing Across the Curriculum* and *Writing to Learn* curriculum, the subject of critical thinking must be approached explicitly. “Conscious exploration allows the writer to make connections with the subject matter and with himself or herself, encouraging reflection on what he or she knows and has learned.” (Gammill, 2006)

Factoring in the Target Group

Urban Schools and At-Risk Students

Some of the literature on critical thinking methods is specifically oriented towards practice with certain groups. In particular, there were emergent themes regarding inner-city youth, Asian students learning English, and students in China and Korea adopting collaborative learning structures.

Students in urban schools are often at-risk for literacy development. In working with inner-city teachers, Delpit argues for increased incorporation of critical thinking methodology because of its relevance in higher order thinking. She summarizes some of the critical thinking strategies that her mentees were using in reading and writing, finding that a form of dialogical reading when used with younger students of varying reading levels, was effective in helping the students comprehend difficult texts and complex metaphors. In addition, she recommends choosing familiar metaphors and stories from the students’ lives to help them connect to the school material. (Delpit, 2006)

In separate study of inner city students, Morrell used critical reflection of pop culture to enable students to develop language competencies. In his method, students and teachers created authentic dialogue which focused on the experiences of the students themselves. After teaching the basic structure of historical analysis in classic poetry, the instructor invited students to do the

similarly structured evaluations using hip-hop music, film, or mass-media. In this way, students built upon their personal experiences and re-examined current pop and media culture. The author also used film to engage students in critical dialogue about themes in the media and its influence upon their own lives. In a final project, the students evaluated mass media by looking critically at how mass media news programs portrayed themselves, urban youth. (Morrell, 2002)

Asian Students

Cultural unfamiliarity with critical dialogue strongly affects students of Asian backgrounds, as reported by several researchers. In Australian universities, where the number of Asian students is increasing, instructors have attempted to introduce critical thinking skills into the classroom as part of the curriculum. Elsegood describes some difficulty in achieving critical dialogue because, “unfamiliarity with the pyramid hierarchical structure of Western reasoning made it difficult for [the students] to distinguish between main claims and minor claims.” (Elsegood, 2007) Instructors consider this disconnect to be cultural rather than linguistic issue. Thus, instructors began teaching critical reflection and dialogue as a framework for understanding western argumentation. The use of concept mapping and writing was most suited to helping students visibly see the structure of arguments and counter argumentation. By deconstructing, reconstructing and mapping claims, students were able to see the logical and illogical connections between arguments. In addition, other critical thinking methods were employed, such as oral argumentation, debate and extended essays, once students had become accustomed to the structure or critical discussion. (Van Gelder) (Elsegood, 2007)

Pohl recommends a similar critical reflection of language which helps students identify assumptions, build awareness and increase “reflective skepticism.” (Pohl) In this study, English language learners were asked to consider why they were learning English, what political factors

had influenced this action, and additional questions designed to help the learner stand outside the action and reflect on the process. Pohl reports that through this critical engagement, students developed language proficiencies while gaining additional contextual understanding for the “wider context in which they are learning English.” (Pohl)

Another related topic in cultural critical thinking is the use of collaborative learning structures within traditionally authoritarian school environments. In a study of schools in China and Korea, Dong et.al experimented with the introduction of collaborative learning where students had no traditional models for situations in which adults weren't the authority. After reading a story, students engaged in a collaborative reasoning session which was similar to the creative controversy method previously discussed. Because the students came from backgrounds where adults were always the authority, the authors questioned how well the students would adapt to a structure which lacked an “expert opinion.” The study found that students not only adapted naturally to the structure but additionally used argument stratagems which were typical of students raised wholly in western school system. Argument stratagems are defined by the author as “is a recurrent pattern of talk that embodies a reasoning strategy or that serves a social function in a discussion.” (Dong, Anderson, Kim, & Li, 2008) An example of such a stratagem is to put oneself in the place of the main character at a crucial decision making point.

In a separate study, these argument stratagems were found to promote critical thinking when used often within group structures. Once introduced verbally, there was a tendency of the group to use the same stratagem in different contexts. (Cook, 2008) This interjection of stratagems provoked critical thought by pushing participants to consider different rationales behind characters' decisions and further to create their own and personalize the experience. The Korean and Chinese school experiment in collaborative reasoning helps to prove the

transferability of certain structures in promoting higher order and critical thinking skills between cultures.

Homogenous Groups

Bucy encountered difficulty in stretching thinking and widening the perspective of her students when they all came from similar backgrounds. For this, she adapted the creative controversy model and had the students assume (using role play) the standpoint of current outspoken personalities on the contextual topic. By introducing this method, students were more apt to connect personally with the material and engage in critical dialogue from a number of different perspectives, rather than simply their own. “By using this method, rather than covering the issues, we uncover them, which encourages future learning for students.” (Bucy, 2006)

Nursing and Medical Developments

Much of the most recent literature on critical thinking methodology has been published in relation to medical studies – specifically regarding nursing schools. One method that is currently being debated is the case-based method. Within the medical profession, the method is slightly different and more structured than within the general critical thinking education movement. In it, learners are challenged to analyze problems, make inferences based on little information and finally make decisions on uncertain ambiguous issues – much like real life. The goal of this structure is to simulate a real world professional context.

In a study by Kim, this case-based method was found to be far more effective in promoting critical thinking than traditional lectures. The study looks at structure and development of case in influencing student learning. While they regard the case-based method as superior in promoting critical thinking, they could not identify singular structures within the method that led to an increase in critical thinking.

Another push within the medical field has been the recent emergence of “appreciative inquiry,” a method which stems from the organizational and change management business models. When used in medical education, collaborative groups engage in dialogue to identify processes that worked well. This occurs through both inquiry and discovery. Group members then build on these positive moments to create a shared vision of success. The stages of development within the group are highlighted in the 4 D’s. Discovery, Dream, Design, Destiny. Shreeve has termed this approach “appreciative pedagogy,” and adds that while it has roots in inquiry learning, it additionally encourages natural active participation with a positive focus. (Shreeve, 2008) Further evaluation of its effectiveness is not apparent within the literature.

Assessment and Assessment Validity

As noted earlier in relation to Tsui’s analysis of best practice within universities, assessing the effectiveness of critical thinking interventions has been subject to debate in recent years. In a meta-analysis of studies reporting on the effectiveness of critical thinking interventions, Abrami reports that while the general consensus in the studies positively linked critical thinking interventions to an increase in student critical thinking abilities, results were often contradictory and there was additionally some evidence of negative impacts. (Abrami, et al., 2008)

When breaking down the methodologies for effectiveness, Abrami used the following descriptors: general, immersion, infusion and mixed. General refers to teaching critical thinking skills separately from course content material. Infusion refers to subject specific instruction in which students are guided and encouraged to think critically through explicit instruction. The immersion method is similar in its subject specificity, but critical thinking is not taught explicitly. The mixed approach is used to teach students critical thinking within the discipline

using the immersion or infusion approach, but this instruction is also supplemented by an additional line of instruction which explicitly teaches the CT skills. The mixed method was found to be the most effective, while the immersion method in which CT skills are not explicitly taught had the smallest effect. Moderate effects were found for the general and infusion approaches. (Abrami, et al., 2008)

The study additionally identified other variables effecting CT skill development, noting teacher preparation and the choice of methodology as having the most impact on student learning. (Abrami, et al., 2008) Snyder and Snyder also address this in research on designing teacher preparation programs. They note the four biggest inhibitors in adopting critical thinking methodology are the lack of training, lack of information about the methods, preconceptions about what critical thinking is, and time constraints.

The Abrami study also indicates that collaborative learning has a moderate effect on CT skill development. Evaluation results from online learning studies were discounted by the team because the studies reported only qualitative results for the most part.

“Researchers seeking to measure critical thinking must be content with measuring the product of thinking – there are very few, if any, techniques for measuring the cognitive process in individuals. In addition, most undergraduate critical thinking studies seek to measure change in critical thinking after a one-semester course; existing assessment methods may not be precise enough to measure this small-scale change.” (Hofreiter, 2005)

There are several established critical thinking tests which use multiple-choice scoring to assess the candidate. These have high reliability, but have been criticized for over-simplification. On the other hand, essay exams, like the Watson-Glaser Critical Thinking Appraisal which use problem solving and evaluation to score student responses have been contested because of

validity concerns. The Cornell Critical Thinking Test has shown to have several items in which gender favorability plays a role. (Hofreiter, 2005) Hofreiter also reports that after the Delphi study, new instruments including the California Critical Thinking Disposition Inventory and the California Critical Thinking Skills Test were developed, but validity concerns remained. As recently as 2008, studies report that there still exist validity concerns with the WGCTA, the oldest and most established instrument (Abrami, et al., 2008)

Most of the studies examined for this review used one of the above instruments or designed their own. In a report by principal John Crook, a noted increase was made in critical thinking skills of the students at Westside High School. After a three year intervention in which the school worked closely with Dr. Richard Paul to redesign curricula, student scores on the International Critical Thinking Assessment increased. The test was incidentally also designed by Paul. The review found that students not only improved significantly on this critical thinking test, but additionally on other state standardized tests. Teachers also reported satisfaction in students' ability to use the terminology and skills of CT throughout the school. "There is no one best way to measure critical thinking, but the assessment, the higher order questioning, and the consistent use of the elements and standards show that the students have become better thinkers." (Crook, 2006)

Review of Critical Thinking Initiatives

The following pages include reviews of current educational initiatives within the field of critical thinking. Organizations featured were located on the world wide web, using Google and various search terms in combination with “critical thinking.” These terms included “organization,” “agency”, “education,” “innovative,” “best practice,” and “initiative” among others. While the search results returned numerable links, many were not chosen because they did not suit the criteria. To fit the criteria the organizations needed to focus on critical thinking and methodology and information on the website need to be current. Agencies that had prior involvement with OSI programs were not reviewed. Several organizations offered workshops on a for-hire basis, but provided very little information as to their background and philosophy, thus also being disregarded. The resulting organizations which are featured include two educational “think tanks,” which promote the study and understanding of critical thinking issues at a scholarly level, a literacy-oriented project, a media-oriented project and a sub-division of Relief International, a well-known humanitarian agency. Following the highlighted reviews, there is a brief annotated description of other organizations and initiatives which may be of interest to future study.

Title of Organization: *The Critical Thinking Community/Foundation for Critical Thinking, The Center for Critical Thinking and Moral Critique*

Website: <http://www.criticalthinking.org/>

The Critical Thinking Community, also titled *The Foundation for Critical Thinking* and *The Center for Critical Thinking and Moral Critique [CCTMC]*, is a non-profit organization based in Dillon, California. The intended mission is to “work together to promote essential change in education and society through cultivation of fair-minded thinking. To make critical thinking the basis of education.”

The CCTMC was founded in 1980 following the first International Conference on Critical Thinking. Dr. Richard Paul, a noted scholar in the field, was instrumental in its establishment. The organization is affiliated with Sonoma State University, where Paul is a professor Emeritus. In 1990, the Foundation for Critical Thinking was set up to support the CCTMC. The Foundation integrates research from the Center for Critical Thinking into instructional aides and resources to help educators improve their instruction. A wide variety of publications is available from the Foundation’s website including DVD’s, books, guides, and videos. The Foundation is also active in different areas involving training, including the National Academy: Training for Trainers, the International Academy on Critical thinking, workshops and professional development.

Two sub-organizations function underneath the Foundation’s umbrella. One is the National Council for Excellence in Critical Thinking. The role of the council is to foster, uphold and protect high academic and intellectual standards of critical thinking. To date, the council has more than 8,000 members. The Council has published elements, standards, and behavioral traits to help define the field of critical thinking, much of which is found in the literature that has been

reviewed in this report. The Center for Critical Thinking serves as a body within the foundation for advanced research and information dissemination. The CTC partners with the College Board, the US Department of Education and various colleges to establish critical thinking within the curriculum.

Another sub group within the CCTMC is the International Center for Assessment which partners with schools to develop cost-effective ways of assessing CT programs which have been implemented. This Center has developed the International Critical Thinking Test, cited earlier in the assessment portion.

The final subset of the CCTMC is the Critical Thinking Community, an online facet that invites free membership, online book study, and videos.

The CCTMC is a highly active organization within the field. The founders and professors who lead the program are noted authors in the field, and have been since the initial critical thinking debates in the 80s. From their website, we learn that

We receive more than 150,000 unique visits per month on our website, from more than 100 countries. We reach out to educators at all levels, in all subjects and disciplines, and develop curriculum materials to achieve this end. We also develop critical thinking books and guides for anyone interested in developing their reasoning abilities. Moreover, we sponsor conferences, academies, seminars and workshops in critical thinking. Tens of thousands of educators, government officials, business leaders, home study parents, graduate students (and others) have attended our conferences and workshops since our inception.

CCTMC offers online courses for teachers, where they may receive graduate credit in either nursing or philosophy. They engage with schools in customized professional development programs. Independently, they offer workshops in various applications of critical thinking as well as instruction on fundamental skills such as Socratic Questioning. They sponsor the International Conference on Critical thinking, which this year is titled “Fostering Intellectual Discipline.” Additionally, they sponsor the Annual Conference on Critical Thinking and Education Reform.

The Foundation publishes numbers handbooks and guides for teachers in various languages including English, German, Japanese and Arabic. They have published several assessments of critical thinking in universities. The organization subscribes to YouTube and broadcasts some of its workshop portions on its own YouTube Channel.

Some of the most comprehensive of its publications include *Thinkers' Guides* which are a set of 20 handbooks directed towards helping readers achieve clarity on theoretical and practical topics. The majority of the texts are between 20 and 80 pages and were published between 2004 and 2009. Several books on critical thinking methods have also been published and are widely available in libraries and online bookstores.

The most recognized figures within the organization are Dr. Richard Paul, who is “considered one of the founders of modern critical thinking and is internationally recognized for his contributions to the field of critical thinking, for advancing and further developing a substantive concept of critical thinking,” according to the site. He has authored eight books and over two hundred articles. Geographically he has been involved with universities and programs in North America, Costa Rica, Puerto Rico and Amsterdam. Additionally, he designed the test reviewed previously about the results at Westside High School, and is a featured author within the Delphi report.

Dr. Linda Elder is an educational psychologist and prominent author often featured in articles with Dr. Paul. She has co-authored four books and several *Thinker's Guides*. Dr. Gerald Nosich and Dr. Enoch Hale are speakers and authors who work within the organization to develop curriculum and standards.

Theoretically, the CCTMC retains close ties to the literature. The website encourages values like intellectual humility and curiosity in students. Additionally, they explain that the

problems students face in today's world are vastly different than ever before, thus advocating different thinking to suit the situation. Paul places the current wave of critical thinking as a move away from earlier theoretical and practical applications as it attempts to define itself more clearly and establish evidence behind earlier expectations. In this current stage, there is a major focus on developing assessment tools, defining critical thinking more clearly, and evaluating programs rigorously.

Title of Organization: Just Think**Website: www.justthink.org**

Just Think is a non-profit organization located in San Francisco. Its mission is to “educate young people to lead healthy, responsible lives in a dominant media culture, and to develop and deliver cutting edge programs to engage youth in critical thinking and creative media production.”

Just Think was founded in 1995 as a response to the growing influence of the media culture on youth. It targets a diverse group of under-privileged youth in the Bay Area and engages them in Hip Hop and Media Literacy courses. Often former students will lead the workshops, which have since branched out into the international arena with programs focusing on peace building, intercultural communication and self-representation. Representative produced by the students have been screened at film festivals such as the Sundance Film Festival.

Just Think has several publications including a newsletter and various films which can be viewed on the website. They have also authored various curricula which address the intersections between youth, critical thinking and identity. *Changing the World*, is an analysis and evaluation of mass media; *Flipping the Script: Critical Thinking in a Hip-Hop World*, is a course in which students analyze lyrics, songs and video construction. In the course *Health and Media*, students reflect on nutrition, sex, violence, drugs and alcohol. *Hidden Heroes*, one of the organizations standards-based curricula, engages students in telling their community’s story by focusing on local heroes. In this project, students define the criteria of what a hero is and then use media to record their influences. *Senior Year* is a curriculum which was produced by former students. This curriculum analyzes the effect that media has on youth in general and helps students find positive ways to engage with it.

The organization is run by the Board Chair, Daniel Kunstler, and staffed by many including Elana Rosen, co-founder of EduTopia, an innovative media partnership with the George Lucas Foundation. Among other larger schools, organizations and businesses, the organization has links to Columbia University and Yahoo Europe.

Just Think's projects appeal to the theoretical underpinnings of the critical thinking movement in several ways. First, the critical response and evaluation of propaganda is highly evaluative in nature and requires discussion and thought from multiple perspectives. Engagement with one's surroundings is observable in the *Freedom Projects*, in which the students create student-led workshops and arrange parent education panels. Additionally, Just Think students also make digital self portraits, which highlight their relation to themselves and their surroundings.

Just Think has been most active in the Bay Area with presentations, projects and courses within local charter schools. "Young African-American women from San Francisco's Bay View Hunters Point neighborhood learned to reflect and express through video their personal experience with violence and murder in their community through this intensive Just Think program. Their completed video, *Where We At*, was screened in the students' neighborhood, at the San Francisco Museum of Modern Art, and at the Gen-Y Studio of the Sundance Film Festival."

Youth Media Educators is a project which provides students with training in media arts over a six-week paid intensive summer program. "YME Student/Interns learn to critically think about the media as they master the core concepts of media literacy, engage in media production, learn essential workplace skills and gain peer-to-peer teaching tools."

In addition to local work, Just Think has operated projects in Dubrovnik, Bhutan and Zimbabwe. In these projects, students participated in intensive media training which partnered critical thinking skills with video tools. Through the activity, they documented their own stories, resulting in six short documentary films.

In Bhutan, “The objective of the program was to assist Bhutanese students in the mastery of basic critical thinking skills and media production methodologies. The underpinning purpose of these productions was to provide young people in Bhutan with the ability to understand media information and think for themselves.”

Just Think offers additional support for teachers who wish to incorporate critical thinking and evaluation into their own curriculum. Current innovative programs at Just Think include *Ignite Your Mind*, an interactive media literacy course for teachers and community workers designed to aid them in incorporating media issues with critical thinking. *Media Education, Art and Literacy* is a project designed to model the effectiveness of integrating critical media literacy within the core middle school curriculum.

Title of Organization: ProLiteracy
Website: www.proliteracy.org

ProLiteracy is a non-profit organization located in Syracuse, New York. Their mission stems from the belief that literacy has the power to end poverty, injustice and discrimination, and that adults who read raise children who read. In that interest they promote and support literacy projects internationally.

ProLiteracy was founded in 2002 when Laubach Literacy International and the Literacy Volunteers of America merged into one organization. Their reach is global, influenced from their founder's days as a missionary in the Philippines. Frank Laubauch is now considered a leader in the contemporary Adult education movement within the United States, according to the website. Ruth Johnson Colvin lead the Literacy Volunteers before the merger, setting up the Swaziland's only literacy program at the time, working on the "Readers are Leaders" program in Zambia, and training literacy teachers in Papua New Guinea, Madagascar and Cambodia. David Harvey, the current CEO, was formerly in charge of the AIDS Alliance for Youth and Family.

As material, ProLiteracy boasts publication of the only weekly adult learning newspaper, a periodical directed at granting access to new adult readers and ESL readers. The paper, *New for You*, uses "plain English" which is easy to understand and geared towards struggling readers. A subset of the organization is the New Readers Press, which publishes various books and materials including classroom materials specifically for ESL learners, Adult education, GED training and language based intervention for middle and high school. They additionally publish guides for implementing and evaluating literacy programs.

ProLiteracy takes a local approach in incorporating literacy into community action projects at their sites. Literacy work is focused on basic education for children and adults, as well as peace education. The organization strives to implement holistic approach to literacy by

embedding it within relevant work projects. They train local trainers and incorporate local language into the process of improvement projects.

Politically, ProLiteracy advocates public policy which is in the best interest of adult learners. They publish material for adults and young adults with learning disabilities as well as host an annual conference. Their website promotes the Adults Achieving the American Dream Act, the National Health Literacy Act, the Individuals with Disabilities Act and the Workforce Investment Act.

Internationally, ProLiteracy is involved in work with 50 developing nations. These include Albania, Kosovo, Bangladesh, China, Indonesia, Laos, Mongolia, Uzbekistan, Angola, Burundi, Ethiopia, areas within the Middle East and Latin America. Here, they partner with non-governmental organizations to teach literacy in local languages, focusing on employment, peace education and conflict resolution. Some of these initiatives include the Literacy for Social Change curriculum, which incorporates math, reading and critical thinking. This program partnered with PACE in Ghana to improve family literacy and increase access to reading materials. [While this is not necessarily the explicit focus of OSI, the ProLiteracy organization seems to be extremely well networked within the local context and could prove an interesting link to the field of adult literacy in new countries] The Literacy and Family initiative is a project to train trainers in innovative adult literacy methods. The Muslim Outreach Initiative strives to educate and advance the education of Muslim girls.

Title of Organization: National Center for Teaching Thinking
Website: www.nctt.org

The National Center for Teaching Thinking is a non-profit organization which provides educational services for schools and colleges interested in using creative and critical thinking structures. They are active in training, workshops and staff development programs worldwide, focusing especially on practical methods.

NCTT was founded in 1989 after a three year pilot project by the Northeast Regional Laboratory. The organization is located in Massachusetts. In 1994 it sponsored the 6th International Conference on Thinking and in 1996 aided the founding of the Singapore Center for Teaching Thinking. Presently, NCTT is partnering with IDRAC Polytechnic in Dhabi to pilot a new thinking program in the Middle East.

The NCTT has a plethora of publications including books and guides on lesson design and critical thinking. CD's, blackline masters and graphic organizers are also available. Sample lesson plans are published for teachers, as is a newsletter on pedagogy and classroom practice which incorporates critical thinking. They publish a "Habits of Mind" series as well as textbooks on critical thinking. Members of the organization designed the Cornell Critical Thinking Test.

The direction of the organization is given by Robert Schwartz. Other prominent names within the organization include Barry Beyer, Robert Ennis, David Martin, Art Costa formerly of ASCD and David Perkins of the Project Zero Visible Thinking initiative at Harvard. Together, they comprise some of the most respected scholars in the critical thinking field.

NCTT offers year-round programming to engage students in thinking skills and intellectual habits of mind. It provides educational resources at all educational levels and its trainers have experience in leading diverse groups. Often, they are contracted for professional development within the K-12 setting of the United States. Here the main areas they work within

are : *Infusing Critical and Creative Thinking into Content Instruction K-12, Developing Problem-Based/Decision Based Units, Infusing Instruction in Critical Thinking into Core Curriculum Courses in Higher Education, and Assessing the Quality of Student Thinking*. NCTT also offers seminars in “thinking-based learning,” as well as seminars for graduate credit.

NCTT has been active in onsite staff development programs in Great Britain, Israel, Singapore, Hong Kong, United Arab Emirates, and Northern Ireland. They have additionally provided programming in New Zealand and Singapore. A summer institute for educators is hosted in Massachusetts. The NCTT additionally attends and presents workshops at an International Conference on Thinking, which is coordinated by a committee led by David Perkins. This conference has existed since 1982 with the goal of bringing together innovators in the field of education, business and other fields to work on the “how” of problem solving.

Title of Organization: Relief International – educational programs – Schools Online
Website: <http://ri.org/program3.php>

Relief International is one of the larger humanitarian aid agencies, and operates programs on a number of different planes, only one of which is educationally related. They are designated as a charity/humanitarian non-profit 503(1) organization. The organization focuses on post-conflict aid and long-term restoration, emergency relief, and rehabilitation of vulnerable communities. The belief that drives RI is that long term positive involvement can help to bring about social change.

In educationally specific programming, Relief International adopts a post conflict focus, working as much as possible with technology expansion through their Education and Global Connectivity Program. RI provides professional development training for teachers in literacy and cross cultural exchanges.

Relief International was founded in 1990, and has retained an international focus since its inception. Educational programming fits into two theoretical classifications: project-based learning and community-based projects.

Highlights of recent programs include the Palestinian Education Initiative. This initiative focuses on empowering women through information communication technology. The aim of the program is to involve youth in civil society development through peer teaching and project-based learning. Relief International has also established a regional teaching center in Jordan, which focuses on helping educators deliver their curriculum using a more student-centered approach. Using relevant, hands-on methods, they aim to challenge students to develop critical thinking and problem solving abilities. The initiative is endorsed by the Jordanian ministry.

The Youth Leadership Program on Free Expression is an initiative to make students and their educators aware of the value of freedom of speech, media and religion within democratic societies. This program operates within Jordan and Tajikistan.

Alternative Organizations:

International Youth Foundation

<http://www.iyfnet.org/>

The International Youth Foundation is a well-networked organization with diverse interests. In part, it seeks to identify partners who provide innovative programming for youth. Part of the mission of the organization is to advance student skills in technology and life skills. Within education, the programs focus on increasing the accessibility and quality of educational opportunity. To this end, they provide programming and training for teachers. Specific programs which focus on leadership exist to engage children to participate as active citizens.

Teaching for Change

<http://www.teachingforchange.org/>

Teaching for Change is an organization which promotes social justice by equipping teachers, parents and students with tools for reading, writing and idea exchange. The organization operates in partnership with schools to help integrate analytical and evaluative thinking. Workshops and publications are part of the materials produced. In 2004, Teaching for Change was recognized as the National Association for Multicultural Education Organization of the Year.

CivNet: civic education community [Civitas International]

<http://www.civnet.org/institucional.html>

CivNet is an international, online community of civic education professionals including teachers, researchers and policy makers. The organization was featured earlier in part in the review of Krogh's democracy project in Bosnia. The aim of the organization is to promote worldwide civic education through networking.

Paulo Freire School

<http://www.paulofreireschool.org/>

A free public school in Tucson, Arizona which focuses on social justice and environmental sustainability

PLAN international Education Programs

<http://plan-international.org/what-we-do/education>

PLAN works in school improvement with the focus of creating child-friendly learning spaces. The organization works internationally to help students gain access to education and to help communities support local educationally programming. PLAN additionally focuses on educating vulnerable communities with employable skills.

Project Zero

<http://www.pz.harvard.edu/index.cfm>

Project Zero is a project within the Harvard Graduate School of Education. It was co-founded by David Perkins, who is also noted for organizing the annual International Conference on Thinking. The project researches and publicizes new material on thinking, particularly with a mind towards Multiple Intelligences. The organization has researched or partnered with a very large number of organizations to produce a large body of research.

Edutopia: The George Lucas Educational Foundation

<http://www.edutopia.org/>

Edutopia is a creative media organization which boasts a „leading edge interactive tool” to help achieve goals of technical, cultural, inspiration and aspiration. The programs core values include project learning, authentic assessment, teacher development, integration of technology and a focus on emotional and social learning. To this end, they publish material in innovative ways, including webinars. EduTopia is the 2009 recipient of the WeBBY award for Best Educational Site.

Coalition of Essential Schools Network:

<http://www.essentialschools.org/>

CESN is a network to support small schools in achieving certain principles. Among these are personalized education, equitable environments and intellectually challenging activities. The network promotes critical thinking in reading and writing and has offered workshops in the past to further professional development.

Washington State Critical Thinking Project

<http://wsuctproject.wsu.edu/ph.htm>

The goal of the WSCTP was to establish a means to track student improvement in critical thinking skills. The site is no longer current, but a model rubric and related research are posted.

Harvard Visible Thinking

http://www.pz.harvard.edu/vt/visibleThinking_html_files/VisibleThinking1.html

The Visible Thinking project at Harvard is geared towards researching connections between student thinking and content learning across subjects. There is a wide variety of adaptable methods on the website. The material is geared towards use by K-12 teachers and school leaders, and seeks to simultaneously improve students' thinking skills and deepen content learning across genres.

South African Education and Environmental Project

<http://www.saep.org/index.php>

SAEP is a local organization in Cape Town, South Africa, that works to support the educational and holistic development of students from impoverished areas. They focus on several student age

areas, including early childhood development, high school programs and a bridge year. Some of their projects include the establishment of a township debating league and a media school for journalism training. SAEP also runs a Center for Innovative Education and Community Service, which provides new programs to connect environmental service and exchange projects for students.

Association for Democratic Initiatives

<http://www.adi-macedonia.org/>

ADI is a non-governmental organization which works to promote peace and stability in Macedonia and Southeast Europe. It organizes various programs in human rights areas and in education. The educational programs focus on the empowerment of youth, improving access to and competency in using technology, and democratic participation.

EAEA – European Association for the Education of Adults

<http://www.eaea.org/>

EAEA is a non-profit organization which partners with countries within Europe to advocate for lifelong learning within the adult community. The organization seeks to improve best practice through research, publication and projects. The projects themselves are wide-ranging, aimed a variety of populations within the adult community. Current and past projects have worked in the ageing population, prison education, active citizenship, cooperative learning and intercultural education, among others. The website has accessible and well-archived material on methodologies.

Morningside Center for Teaching Social Responsibility

<http://www.morningsidecenter.org/>

The Morningside Center is a local organization in New York City, which partners with schools to implement programs in community building. The programs additionally focus on conflict management, peace building and the development of social skills. Among other features, the organization developed the website www.teachablemoment.org, which provides up-to-the-minute strategies, programming and methods to help teachers deal with difficult current events.

Critical Thinking Consortium

<http://www.tc2.ca/wp/constortium>

The Critical Thinking Consortium is a non-profit association of institutions, teachers and school district partners who seek to promote critical thinking. Through research and publication, as well as curricular development, the consortium focuses on educational change. It offers workshops in critical thinking education.

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