Ankara University, Journal of Faculty of Educational Sciences, year: 2006, vol: 39, no: 2, 177-191

A Reflection on Three Web-Based Teaching Critical Thinking: Toward A Compromise Approach

Bakhtiar Shabani Varaki*

ABSTRACT : Many literature reviews have shown that Web-based Instruction (WBI) is an effective learning tool for general education courses which require lower order thinking skills. There is not sufficient evidence to support the effectiveness of WBI in teaching courses which require higher order thinking skills, critical thinking. Therefore, the main question is whether Web-based Instruction can successfully promote critical thinking. The purpose of this paper is to find an answer to this question. It also will identify the teaching strategies and instructional designs which will successfully promote critical thinking in an electronic learning environment. Some preliminary result of this review could be articulated as follow: Critical thinking is significantly anchored within curricula and related teaching goal. It is highly correlated with students' achievements. According to Dick's taxonomy critical thinking consists of identifying the arguments, considering external influences on the involved elements, applying scientific analytical reasoning, outlining chain of logical orders, and make conclusion. WBI can be an effective medium of instruction for promoting critical thinking if it is delivered on an instructional design specially developed for WBI.

Key Words: web-based teaching, critical thinking, teaching strategy

* Associate Professor of Education, Ferdowsi University of Mashhad, Mashhad Iran E-mail: bshabani@ferdowsi.um.ac.ir

Introduction

There was a long debated on teaching critical thinking in the 1980's and 1990's. Scholars propose different teaching strategies for effective teaching across curriculum. In the first decade of the new millennium, technology got its unique place in education and added a new dimension to the teaching-learning transactions at all educational levels, the Internet, (Henri, 1991; Hill, 1999; Thornburg, 2000). Kraak (2000, p. 51) also saw critical thinking as "an important, perhaps the most important of all present time educational tasks". So, within these superlatives, the (not new) appeal to schools is hidden to educate "critical students" (Lang, McBeath, & Hebert, 1995). For achieving this complex goal, schools and teachers have to be assisted from educational theory and research. Indeed, the major query is what type of instruction can successfully promote critical thinking? In other word, critical thinking is a higher order thinking skill that only appears when students can experience challenge-based instruction and related instructional designs.

This challenge-based approach to instruction could increase students' engagement in the content and helps them see various applications for how the content is used. The underlying assumption is that students will become fluent in their ability to use their knowledge in various learning settings. Accordingly there are some important questions which should be considered. Whether online instruction can successfully promote critical thinking in daily instruction? How we can able to teach student thinking critically in an electronic context? To try to answer these questions represent the central task of this work. Hence, this paper discusses an instructional design to teach student thinking critically in an electronic context.

What is Critical thinking?

Even though an integration of existing theoretical approaches on critical thinking is still missing, it is nevertheless possible to describe "critical thinking" as an important source of improving school achievement. In the literature on critical thinking, various definitions emerged. Scriven (1996) stated that Critical Thinking is the intellectually disciplined process of actively and skilfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action. Angelo (1995) defined Critical Thinking as the intentional application of rational, higher order thinking skills, such as analysis, synthesis, problem recognition and problem solving, inference, and evaluation. Beyer (1987:276) defined that critical thinking is the process of determining the authenticity, accuracy, and worthiness of information or knowledge claims. He also stated that critical thinking involves using

criteria to judge the quality of something, from cooking to a conclusion of a research paper. In essence, critical thinking is a disciplined manner of thought that a person uses to assess the validity of something, i.e.: statements, news stories, arguments, research, etc. (Beyers, 1995). Facione (1998) categorized 6 core skills of critical thinking self-regulation, interpretation, analysis, inference, explanation and evaluation as depicts in Figure 1 below:

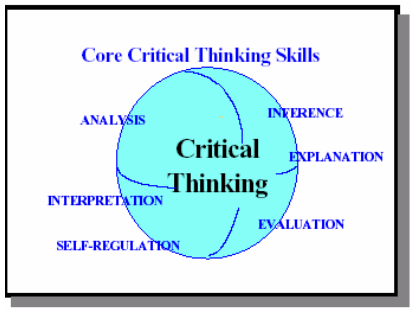

Figure 1: Core skills of critical thinking

Source: Facione, P.A. (1998). Critical Thinking: What It Is and Why It Counts. California Academy Press.

Facione (1998) identified 6 basic skills of critical thinking from the experts' consensus regarding critical thinking and the ideal critical thinker in the APA Delphi Report, Critical Thinking: A Statement of Expert Consensus for Purposes of Educational, 1992. Assessment and Instruction. In conclusion Facione stated:

> "Critical thinking is the process of purposeful, self-regulatory judgment. This process reasoned consideration to evidence, context, conceptualizations, methods, and criteria."

Meyers (1998) identified 8 steps involved in the critical thinking process which he divided into two categories known as problem solving and decision making process. The 8 steps process depicts in table 1.

Table 2: 8 Steps in the critical thinking process: divided into two categories

Problem Solving	Decision-Making
1. Recognize and define a problem to be solved.	1. Identify and define the goal to be achieved and/or the opportunity that presents itself
2. Identify the root causes of the problem.	2. Analyze the opportunity presented and the relevant issues to be addressed.
3. Identify criteria for evaluating possible solutions.	3. Identify criteria for evaluating possible strategies and actions to achieve the goal(s).
4. Identify possible solutions	4. Identify possible strategies and actions against criteria
5. Evaluate possible solutions against established criteria.	5. Evaluate possible strategies and actions against established criteria.
6. Select "best" solutions.	6. Select "best" set of strategies and actions
7. Develop a detailed plan to implement the solution(s) chosen.	7. Develop a detailed plan to implement the strategies and actions chosen.
8. Evaluate the effectiveness of the solution, and ideally, identify opportunities for improvement	8. Evaluate the effectiveness of the strategies and actions, and ideally, identify opportunities for improvement.

Figure 2: 8 Steps in the problem solving and decision making process

According to this review, critical thinking consists of identifying and analyzing arguments, of considering external influences on arguing, of scientific analytic reasoning, and of logical reasoning. As relevant synonyms for this definition of critical thinking, also "everyday reasoning", "informal reasoning", or "pragmatic reasoning" were used (e.g., Galloti, 1989). In general, "critical thinking" is a mental activity of evaluating arguments or propositions and making judgments that can guide the development of beliefs and taking action.

Web-based teaching Critical Thinking

In the field of teaching and learning, some approaches used to develop programs for promoting thinking skills in students (Hager, 1995). However, only extremely few of these programs are recommended by educational researchers (Halpern, 1998). Programs like these should have the following characteristics:

"1. They should consider a disposition or an attitude against critical thinking.

2. They should regard critical thinking as a general skill that must be deepened within different subject matters or contexts.

3. They should offer a segmented and instructionally fully developed training in specific skills.

4. They should focus on all (or many) relevant sub skills of critical thinking and integrate them.

5. They should include parts for stimulating the transfer of knowledge.

6. They should support meta-cognitive skills for assisting self-regulation activities.

7. They should not include formal, mathematical, etc. algorithms, but everyday language problems.

8. They should train students for a several week's or month's period.

9. They should consider the organizational context of classroom instruction" (Astleitner, 2002, 55).

Since it seems very difficult to successfully implement critical thinking into traditional classroom instruction, it is necessary to ask for alternative approaches back to this up. In the new approaches, the teacher should be aided by some supplemental help or the students should be able to work for their own and release the teacher from some duties, accordingly. Such aiding and releasing acts can be identified by internet-based instruction (Astleitner, 2002). However, it is an open question, whether Internet-based instruction can successfully promote critical thinking in daily instruction?

In order to answer this question, different types of general instructional functions which can be delivered by new media have to be differentiated. There are three different types:

3.1. Internet as a tool of critical thinking: without any preplanned instructional design

The Internet which is known as a terrific resource contains hundreds of web sites dedicated to thousands of topics. By careful analyzing the web page's URL and homepage, much information can be obtained and source can be better evaluated for its reliability and validity. Since the students browse the web to obtain specific topics and assignment materials, they should posses searching information skills. Good searchers exhibit the

ability to evaluate critically the information they are finding and apply their judgment to the search process (Rankin, 1999). This is seen in filtering hit lists by skimming for relevancy, refining searches to reduce hit counts, and/or choosing sites of better authority due to prior knowledge of methods for determining information validity or factualness (Eisenberg, 2000). Good problem solving skills and critical evaluation both are needed and exhibited by those most successful in searching the Web (Eisenberg, 2000; Rankin, 1999).

While searching information through online resources, there are certain skills involved cognitively. Hill (1999) described internet searching two phases of cognitive process which divided into six steps. Those two phases are (a) Navigation and (b) Process. In the first phase, navigation, searchers explore the system to find information using purposeful thinking (working on the goal), acting (browsing or searching) and system responding (feedback from the computer). On the second phase process, searchers are attempting to make meaning out of the information found by evaluation, transformation, integration and resolution. The success in searching was very dependent on user knowledge, specifically meta- cognitive abilities, familiarity with the computer system being used, and prior subject knowledge. When students use a problem-solving approach to searching, they have less difficulty dealing with unfamiliar search tools, and computer systems (Rankin, 1999). Rankin (1999) pointed out that searching information in the electronic context also involved a problem solving process. Eisenberg and Berkowitz developed a model of problem solving for information in1987 known as a Big6 Information Problem Solving Approach. Their research shows that all successful information problem solving involves 6 steps: (a) Task Definition, (b) Information Seeking Strategies, (c) Location and Access, (d) Use of Information, (e) Synthesis, and (f) Evaluation. In this model task definition involves students defining the information problem and identifying the information needed in order to complete the task. The information seeking strategies step involves brainstorming the range of possible sources and evaluating those sources to determine priorities. On the location and access step students locate sources (intellectually and physically), and find information within sources. On the fourth step, use of information, students engage (read, hear, view, or touch) the information and extract relevant information. In synthesis, students organize information from multiple sources and present the information. And finally, on the last step, evaluation, students judge the product and the information-seeking process.

This meta-cognitive ability or the ability to "think about thinking" is a crucial component in applying the cognitive skills effectively to a complex task such as searching the Web for information (Beyer, 1987; Hill, 1999; Rankin, 1999).

Based on the critical thinking skills definition and information search skills identification given in the aforementioned statements, indicates the similarity between those two skills. Table 2 depicts a summary of the similarities.

Table2:Similarity between critical thinking skills and information searching skills

INFORMATION SEARCHING SKILLS	CRITICAL THINKING SKILLS
Task Definition Information Seeking Strategies Location and Access Use of Information Synthesis Evaluation *Eisenberg and Berkowitz (1987)*	self-regulation, interpretation, analysis, inference, explanation and evaluation *Facione (1998)* analysis, synthesis, problem recognition and problem solving, inference, and evaluation *Angelo (1995)*
Credibility Accuracy Reasonableness Support *Harris (1997) CARS Checklist for Research Source Evaluation*	Skill of Gathering and Applying Information Skill of Problem Solving Skill of Inference Skill of Making Analogy *Saedah & Zaharah (2000)*

Given aforementioned categorization, both teaching critical thinking and information searching skills involves:

Asking questions

Defining a problem

Examining evidence

Analyzing assumptions and biases

Avoiding emotional reasoning

Avoiding oversimplification

Considering other interpretations

Tolerating ambiguity

Jonassen (1996) and Duffelmeyer (2000) articulated that "criticizing technology" or "the society in general" during daily instruction makes it possible to teach critical thinking and to use new technology specifically as

content of critical thinking. This idea is grounded within the research paradigm of critical theory what bring about the fact, that no empirical evidences are available to proof the underlying assumptions. Accordingly, as it identified by Astleitner (2002) this line of research has little to offer, in spite of the fact that there is a relation to evaluation research focusing on internet quality. Within this area, several comprehensive instruments for criticizing contents of the internet were developed. But, these instruments and their application were not yet proven to promote critical thinking. On the other hand Reimann and Bosnjak (1998) delivered some empirical evidences about the efficiency of computer for critical thinking. They privileged hypertexts as a tool to stimulate and guide critical thinking. In their study, students had to criticize and to expand an argument structure and had free access to a content-rich hypertext. Nevertheless, using the hypertext did not improve critical thinking, surprisingly. They concluded that critical thinking has to be supported by carefully designed instructional activities.

Scarce (1997), Santos and DeOliveira (1999) also found that there is no significant results when using the internet as tool for content presentation. Generally, it is possible to emphasize that internet without any instructional designs cannot successfully foster critical thinking. Being critical about something like the Internet and having some tools available like Email does not warranty critical thinking, at all. Rather, critical thinking is a higher order thinking skill that only appears when students are trained based on specific sub-skills and related instructional activities (Astleitner, 2002).

3.2. Web-based collaborative teaching critical thinking

Based on a comparative study between traditional course and web based discussion forum, Newman, Johnson, Cochrane, and Webb (1996) elucidated that using the discussion forum resulted in better critical thinking, because it provided more learning materials available and more learning opportunities for students and related more often the students arguments to each other. In spite of this significant result, this study is poor to tell about the design of learning environments for fostering critical thinking. More background knowledge about the design of learning environments delivered by Bullen (1998). However, according to Astleitner (2002), a content analysis of students' messages showed that students did not acquire critical thinking. The author gave several reasons for this finding, but without testing them in a controlled setting. Especially, students regretted that there was no possibility to communicate in a synchronic way with each other, because some arguments or problems needed immediate reactions in order to be

clarified and transferred to further discussions. Students found it disturbing that their messages were not organized in a hierarchically way, so it would have been easier for them to find a learning relevant structure in the messages. Sloffer, Dueber, and Duffy (1999) stimulated critical thinking by visualizing elements of the critical thinking process and students asked for assigning their messages symbols that indicate important elements of critical thinking. In addition, they implemented a mechanism that only those students could read other messages which accomplished their own duties. Eventually, a tutor had to motivate students. The research findings showed that many students delivered contributions with high-quality critical thinking content. Nevertheless, there are no comparable research studies to confirm this result.

The process of critical thinking was analyzed by DeLoach and Greenlaw (1999). They were focusing on contributions to discussion forums and illustrated that critical thinking improved in attention to correctness, novelty, complexity, and etc. with the continuing of the discussion process. This result was implemented within an open learning situation; however, many of the students' contributions were not related to the central issues of the discussion process. McLoughlin and Luca (2000) analyzed the cognitive processes interactions which can be identified within the contributions to bring light into this problem. They clarified that within a web-based learning environment, students only exchanged their contributions without critically appraising the contributions of others based on examinations or significance negotiations. Astleitner illustrated the following reasons for the missing of critical thinking:

1. "There was no learning guidance (by complex learning tasks).
2. Students did not get instruction telling them that they should control learning systematically by their own.
3. Students did not handle social-emotional problems in a sensitive and responsible way, because students were afraid of hurting others by critical statements or being hurt by others (2002, 58)."

Therefore, the effect of Web-based collaborative teaching critical thinking cannot be evaluated, properly. As Astleitner (2002) articulated the given results show some instructional elements that can help to improve the situation, but these elements have not yet been tested within controlled research.

3.3. Web – based individual teaching critical thinking

There is some evidence within the given studies that critical thinking can only be promoted successfully by internet when it delivers some teaching functions (Astleitner, 2002). Web – based individual teaching critical thinking can be divided into computer simulations and into tutorial-based logic software.

3.3.1. Computer Simulations

There are very few studies dealing with critical thinking and computer simulations. De Jong and van Joolingen (1998) articulated in their comprehensive review on computer simulations and learning. They articulated in the comprehensive study that some general personal and situational conditions must be realized in order to be successful in fostering critical thinking skills. Accordingly, Astleitner (2002, 58-59) emphasized that:

> "Students should dispose of skills in hypotheses testing and in findings relevant knowledge. Students should have access to knowledge bases relevant for the subject matter of the simulation. Finally, students should have system guidance when exploring relationships between important variables relevant for modeling the subject matter of the simulation. Such guidance can be given by certain learning tasks and by overviews of relevant variables and their relationships to each other within the computer simulation."

In the field of Biology, there is an evidence to identify a computer simulation influenced positively critical thinking (Rivers and Vockell, 1987). Within these two studies, critical thinking was seen as one component of several higher order thinking skills. In the field of Electronics, Gokhale (1996) showed that an instructionally well-equipped computer simulation increased higher order thinking skills. Also, Yeh and Strang (1997) provided some evidence for the effectiveness of computer simulations in fostering the higher order thinking skills.

Despite the fact that there is no research based data to support the effects of computer simulations on all critical thinking skills in a comprehensive way, there are some indications that learning within computer simulations is closely related to critical thinking.

3.3.2. Logic software

The influence of the software training program on informal reasoning has been examined by Van Gelder (2000a). The software training program offers an instructional design for self-regulated learning, without any teacher

assistance. The program used for long-term trainings in critical thinking and realized a learning context inserted within everyday problems. It graphically demonstrated the subject matter, contained various control mechanism and provided constructive feedback to the students. When the software training program has compared with traditional classroom instruction in fostering critical thinking, two pretest-posttest studies showed medium effect sizes. Other logic software has been developed to promoting critical thinking skills. This program proposes many learning tasks with solutions, quizzes, and structured synopsis of the subject matter. Van Gelder (2000b) has reported the successful use of this program, too. Nevertheless, the training-based program can only be privileged together with an accompanying book and a related teacher-centered curriculum.

Stenning, Cox, and Oberlander (1995) reported a similar positive result in respect to the logic software. They called the program as Hyper proof. This program, however, focused on skills in formal logic which are not related to critical thinking skills, closely. In compare with all other ways of using internet, as (Astleitner, 2002) illustrated in his comprehensive review, there are some preliminary result that show some effectiveness back to the Web – based individual teaching for advancing critical thinking.

Conclusion

Critical thinking is a common objective of various disciplines and a goal that most faculties can spire it. Although there are some quite diverse definitions of critical thinking, nearly all emphasize the ability and tendency to gather, evaluate, and use information effectively (Beyer, 1987). In this article, I discussed skills related to critical thinking and three specific web-based strategies for teaching these skills. It is articulated that there are some indications that internet are effective for promoting critical thinking because they are more focused (in the selection and in the presentation of contents and skill trainings), they are more concrete (in using specific tasks for learning), and they can deliver learning relevant feedback more often than traditional classroom instruction. These general assumptions have to be tested in lab and educational practice tests, but they also must be elaborated by relating them to major issues in recent instructional design research and should finally result in the development of a virtual critical thinking school.

Further, at present, teaching critical thinking is an important strategy in advancing teaching and learning in electronic context. Students need to develop and apply critical thinking to their studies, to complex problems they will face in the future in order to compete and survive, and to the

critical choices they will be forced to make as a result the information explosion and other rapid technological change. On the other hand, as stated by Sullivan and Scott (2000):

> "We need to emphasize and require that students use a variety of sources for their research, thereby making them aware that the Internet is just another tool that can be added to their arsenal of information-retrieval sources. It is apparent the internet will continue to influence the school curriculum. Given this reality, students need to master information-literacy skills if they are to harness the potential of this new age of information."

Accordingly, developing an alternative approach to the web-based teaching critical thinking is necessary. I identified the new approach titled "web-based design for teaching critical thinking as a complementary tool". It is considered that whether faculty can change their teaching strategies to use web-based communication tools effectively to help students go beyond being exposed to content the point of critically interaction with it. In other words we need to use the "Internet with indirect instructional functions: collaborative learning and critical thinking" in a different context and different manner. The main idea in this review is that we need a synthesis back to teaching critical thinking that is a teaching method which combines traditional academic instruction with web service as it focuses on critical, reflective thinking and civic responsibility. This program involve students in organized discussion group that addresses real world needs, while developing their academic skills, sense of civic responsibility, and commitment to the community (see figure 1).

On the other hand, this review find undergrad students at Ferdowsi university of Mashhad often find difficulty transferring the skills and knowledge they acquire in the classroom to the real world. When asked to evaluate a thinking situation, they may fail to recognize the significance of classroom content to their own academic development, personal growth and civic integration. Therefore university's faculty should provide students with a complementary tool in the traditional classroom. We used Socratic Questioning Prompts (Macknight, 2000) to teach critical thinking. To make the Socratic questioning method readily usable by teachers, identifiable categories of questions have been established (Richard, 1993): Questions of Clarification, Questions that Probe Assumptions, Questions that Probe Reasons and Evidence, Questions about Viewpoints or Perspectives, Questions that Probe Implications and Consequences and Questions about the Question.

REFERENCES

Angelo, T. A. (1995). *Beginning the Dialogue: Thoughts on Promoting Critical Thinking: Classroom.*

Astleitner, H. (2002) Teaching Critical Thinking Online, *Journal of Instructional Psychology, 29*(2), 53-76

Beyer, B. (1987). *Practical strategies for the teaching of thinking*. Boston: Allyn & Bacon.

Beyer, B. K. (1995). *Critical Thinking*. Bloomington, IN: Phi Delta Kappa Educational Foundation.

Bullen, M. (1998). Participation and critical thinking in online university distance education [WWW document]. URL http:// cade.athabascau.ca/vol13.2/bullen.html

De Jong, T., & Van Joolingen, W. R. (1998). Scientific discovery learning with computer simulations of conceptual domains. *Review of Educational Research, 68*, 179-201.

DeLoach, S. B., & Greenlaw, S. A. (1999). Critical thinking and electronic discussions in upper-level economic courses [WWW document]. URL http://199.111.95.15/econ/www/ paper-eea99a.html

Duffelmeyer, B. B. (2000). Critical computer literacy. Computers in first-year composition as topic and environment [WWW document]. URL http://corax.cwrl.utexas.edu/cac/ current_issue/duffelmeyer.html

Eisenberg, M. & Berkowitz, R. (1987). The big 6 skills information problem-solving approach[On-line]. Retrieved April 1, 2001 from the World Wide Web: http://www.big6.com/overview.htm

Eisenberg, M., Berkowitz, B. & Murray, J. (2000, November/December). Applying the big 6 skills and information literacy standards to Internet research. Book Report, 19, 33.

Facione, P.A. (1998). *Critical Thinking: What It Is and Why It Counts*. California Academy Press.

Galloti, K. M. (1989). Approaches to studying formal and everyday reasoning. *Psychological Bulletin, 105*, 331-351.

Glebas, G. J. (1997). Evaluating the effectiveness of using the spreadsheet application as a cognitive tool to increase mathematics achievement [WWW document]. URL http:// home.att.net/~sabelg/thesis.html

Gokhale, A. A. (1995). Collaborative learning enhances critical thinking. *Journal of Technology Education, 7*, 22-30.

Gokhale, A. A. (1996). Effectiveness of computer simulations for enhancing higher order thinking. *Journal of Industrial Teacher Education, 33,* 36-46.

Hager, W. (Hrsg.). (1995). *Programme zur Forderung des Denkens bei Kindern*. Gottingen: Hogrefe.

Halpern, D. F. (1998). Teaching critical thinking for transfer across domains. *American Psychologist, 53*,449-455.

Henri, F.(1991). "Computer conferencing and content analysis". In O'Malley, C. (Ed.) *Computer Supported Collaborative Learning*. Heidelberg: Springer-Verlag.

Hill, J. (1999). A conceptual framework for understanding information seeking in open-ended information systems. *Educational Technology Research & Development, 47*, 5-27.

Jonassen, D. H. (1996). *Computers in the Classroom. Mindtools for critical thinking*. Englewood Cliffs: Prentice Hall.

Kraak, B. (2000). Erziehung zum kritischen Denken--Eine wichtige--vielleicht die wichtigste Bildungsaufgabe der Gegenwart. *Padagogisches Handeln, 4,* 51-70.

Lang, H. R., McBeath, A., & Hebert, J. (1995). *Teaching. Strategies and methods for student-centered instruction*. Toronto: Harcourt Brace.

Mandl, H., & Friedrich, H. F. (Hrsg.). (1992). *Lern- und Denkstrategien. Analyse und Intervention*. Gottingen: Hogrefe.

Macknight, C.B. (2000). Teaching critical thinking through online discussions, *Educause Quarterly*, No. 4.

McLoughlin, C., & Luca, J. (2000). Cognitive engagement and higher order thinking through computer conferencing. We know why but do we know how? [WWW document]. URL http://cleo.murdoch.edu.au/confs/tlf/tlf2000/ mcloughlin.html

Meyers, G. (1998). 8 steps in the problem solving and decision making process. Retrieved May 2, 2004 from WWW for CSCL_files\Evaluation of Critical Thinking.htm

Newman, D. R., Johnson, C., Cochrane, C., & Webb, B. (1996). An experiment in group learning technology. Evaluating critical thinking in face-to-face and computer-supported seminars. *Interpersonal Computing and Technology, 4*, 57-74.

Rankin, V. (1999). *The Thoughtful Researcher: Teaching the Research Process to Middle School Students*. Englewood, CO: Libraries Unlimited, Inc.

Reimann, P., & Bosnjak, M. (1998). Supporting hypertext-based argumentation skills [WWW document]. URL http:// www.or.zuma.mannheim.de/bosnjak/publications/edmedia98/default.htm

Rivers, R. H., & Vockell, E. (1987). Computer simulations to stimulate scientific problem solving. *Journal of Research in Science Teaching, 24*,403-415.

Santos, L. M., & De Oliveira, M. (1999). Internet as a freeway to foster critical thinking in lab-act#ivies [WWW document]. URL http:// www.narst.org/conference/santosdeoliveira/ santosdeoliveira.htm

Scarce, R. (1997). Using electronic mail discussions groups to enhance students' critical thinking skills [WWW document]. URL http:// horizon.unc.edu/TS/

Scriven, M. & Paul, R. (1996). *Defining Critical Thinking: A Draft Statement for the National Council for Excellence in Critical Thinking*.

Siraj, S & Hussin, Z (2000). Content Analysis of Islamic Textbooks. *Paper presented at Seminar of Teaching and Evaluation, Teacher Training Centre* Kota Bahru, Kelantan Malaysia

Sloffer, S. J., Dueber, B., & Duffy, T. M. (1999). *Using asynchronous conferencing to promote critical thinking. Two implications in higher education (CRLT Technical Report No. 8-99*). Bloomington, IN: Center for Research on Learning and Technology, Indiana University.

Stenning, K., Cox, R., & Oberlander, J. (1995). Contrasting the cognitive effects of graphical and sentential logic teaching. Reasoning, representation, and individual differences. *Language and Cognitive Processes, 10*, 333-354.

Sullivan, M.O. & Scott, T. (2000). *Teaching Internet Information Literacy: A Critical Evaluation. MultiMedia Schools*. Information Today Inc.

Thornburg, D. D. (2000). Renaissance 2000.[On-line]. Retrieved April 28, 2004 from the World Wide Web: http://www.tcpd.org/thornburg/handouts/R2K.pdf

Van Gelder, T. (2000a). The efficacy of undergraduate critical thinking courses [WWW document]. URL http://www.philosophy. unimelb.edu.au/reason /efficacy .html

Van Gelder, T. (2000b). Learning to reason: A Reason!-Able approach. In C. Davis, T. J. van Gelder, & R. Wales (Eds.), *Cognitive Science in Australia, 2000. Proceedings of the Fifth Australasian Cognitive Science Society Conference*. Adelaide: Causal.

Yeh, Y.-C., & Strang, H. R. (1997). The impact of a computer simulation on critical-thinking instruction [WWW document]. URL http://www. coe.uh.edu/insite/elec_pub/html1997/si_yeh. htm