



University of Maryland University College

**CRITICAL THINKING AS A CORE ACADEMIC SKILL:
A REVIEW OF LITERATURE**

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INTRODUCTION

Critical thinking as an outcome of postsecondary education was made explicit by several recent national reports (Association of American Colleges and Universities [AAC&U], 1985; National Education Goals Panel, 1991; National Institute of Education Study Group, 1984). In 2004, a number of higher education associations and leaders of institutional accrediting bodies reached consensus on key outcomes that all students, regardless of academic major, should achieve during their undergraduate study. Among those outcomes, critical thinking was highlighted as one of the six major intellectual and practical skills along with communication skills, quantitative and qualitative literacy, information literacy, teamwork, and integration of learning (AAC&U, 2004). In addition, in the outline of standards for accreditation, the Middle States Commission on Higher Education has identified critical thinking as a major outcome of the general education curricular offerings at institutions (2002).

In relation to international peers, poor performance among United States students in areas of science, math, and general problem solving has reinforced the need for college-level courses which will increase critical thinking skills (Halpern, 2001; National Science Board, 2006). Furthermore, the increasing importance of critical thinking skills is underscored by the 'information society' that students are expected to operate in and contribute to. An increasingly technologically complex and information rich society requires graduates who are able to critically analyze the source, content, and quality of the information provided, as well as use that information effectively. Operating within this context requires the ability to synthesize, analyze, and organize deductions to address complex problems and situations (American Library Association, 1989; Breivik, 2005).

Several curricular initiatives have been undertaken or are being planned by University of Maryland University College (UMUC) that are designed to meet challenges related to developing higher order cognitive processes among students. In order to further inform the discussion related to these initiatives, this review will first provide a brief overview of cognitive development theories and describe how those theories are applied to postsecondary learning environments in order to facilitate critical thinking skills among students. This review provides various definitions of critical thinking and discusses sample studies related to the development of critical thinking among college and university students. Finally, best practices for incorporating and assessing critical thinking skills are suggested.

CRITICAL THINKING SKILLS: THEORETICAL IMPORTANCE

Within the context of learning environments, cognitive psychology provides a framework to understand and interpret how higher order processes such as critical thinking skills develop among students. Theories of cognitive development underscore the importance of learning environments that facilitate student progress in reaching advanced stages of intellectual growth, of which critical thinking skills are an integral component (Kitchener & King, 1984; Perry, 1981; Piaget, 1964).

In theory, cognitive development requires movement through increasingly complex layers of differentiation and integration in the ways that individuals think, value, and behave (Anderson, Krathwohl, & Bloom, 2001; Pascarella & Terenzini, 1991). Cognitive psychology conceptualizes progression from one stage of cognitive development to another as a way to measure the maturity, depth, and complexity of an individual's thought process and intellectual growth (Kitchener & King, 1981; Perry, 1981; Piaget, 1964).

Theories of cognitive development such as the Jean Piaget's (1964) theory of human intellectual development posits a four stage model with 'formal operational reasoning' identified as the final stage of development. The formal operational stage is denoted by the ability to use abstract reason and deduction as well as employ previous knowledge and experiences to less well-defined situations. Achieving advanced stages of intellectual development allows hypotheses presented in multiple contexts to be tested through a systematic process (Pascarella & Terenzini, 1991; Piaget, 1964).

Other theories on cognitive development also use the progression through increasingly complex stages or periods to gauge one's ability to think critically. William Perry's (1981) schema of intellectual development is conceptualized as a series of increasingly complex periods that capture how an individual views knowledge in an epistemological sense. Ideally, individuals reach the final position, 'commitment to relativism', where they commit to specific values and ideologies but are also able to consciously analyze as well as convey new ideas. Advanced stages of intellectual development are marked by the ability to use a reflective process to integrate new knowledge learned from others into existing intellectual frameworks (Pascarella & Terenzini, 1991; Perry, 1981).

More recently, Kitchener and King (1984) have developed a theory of reflective judgment that conceptualizes cognitive growth as a series of seven stages related to "what people know or believe and how they justify their knowledge claims and beliefs" (Pascarella & Terenzini, 1991, p. 32). At the final stage, individuals see knowledge in a constructive sense and acknowledge their own role and experiences in shaping their beliefs (Kitchener & King, 1984).

APPLYING COGNITIVE DEVELOPMENT THEORY: POSTSECONDARY EDUCATION AND CRITICAL THINKING

Theories of cognitive development associate the most advanced stages of intellectual development with the ability to think critically. While the importance of attaining critical thinking skills has been conceptualized through cognitive development theories, in an applied sense, postsecondary learning environments are targeted as an integral component in facilitating the development of higher order thinking processes. The importance of postsecondary education, in terms of applying cognitive development theory so that intellectual development occurs, has to do with the intellectual maturity of individuals enrolled in postsecondary environments. The societal role played by colleges and universities is another significant factor when considering applying cognitive development theory within learning environments in order to facilitate the attainment of critical thinking skills (AASC&U, 2005; Kitchener & King, 1984; Perry, 1981; Piaget, 1964).

With regard to intellectual maturity, late adolescence and adulthood is identified as the time period when most individuals begin to move into more advanced stages or periods of cognitive development and demonstrate the ability to think logically about abstract ideas and systematically test hypotheses. An individual becomes concerned with multi-dimensional, ideological problems and seeking plausible answers rather than seeing things as having only one solution that can be judged either right or wrong. Adulthood should be marked with a demonstrative use of reflective processes to integrate new knowledge learned from others with personal experiences (Perry, 1981; Piaget, 1964). Furthermore, early adulthood is when students should begin to demonstrate a degree of soundness with regard to concepts, coherent thought patterns, and evidence chosen to support arguments or deductions (Kitchener & King, 1984).

While cognitive development theory associates intellectual maturity with age, critical thinking is not constant as “everyone is subject to episodes of undisciplined or irrational thought. For this reason, the development of critical thinking skills and dispositions is a life-long endeavor” (National Council for Excellence in Critical Thinking Instruction, 2006).

Facilitating development of critical thinking is important because higher education is asked to produce graduates who are capable of contributing to society through a chosen vocation that requires discipline specific mastery. Institutions are also asked to produce graduates who demonstrate the capability to apply higher order cognitive skills to solve problems that are not confined to discipline specific areas (AAC&U, 2005).

Critical thinking is inherently linked to effective learning. Being able to think about what one is learning while interpreting and making relations is an important

part of the learning process (Paul, 2005). Critical thinking skills allow students to more quickly assimilate subject-specific course content and also provide a framework that allows students to engage and respond to less-well defined problems (Kurfiss, 1988; Tsui, 2000; Tsui 2002). As a result, students are better prepared to confront both personal and professional challenges (Kurfiss, 1988; Tsui, 2002).

Critical thinking is closely related to educational goals to create lifelong learners because critical thinking is a skill that is applied across multiple subjects (National Council for Excellence in Critical Thinking Instruction, 2006; Bernstein, Marx, & Bender, 2004; Kurfiss, 1988; Tsui, 2002). For instance, discipline specific modes of thinking (i.e. – scientific thinking, mathematical thinking, historical thinking, anthropological thinking, economic thinking, moral thinking, and philosophical thinking) all impact as well as are impacted by critical thinking (National Council for Excellence in Critical Thinking Instruction, 2006). Furthermore, while critical thinking skills transcend specific disciplines, using those skills requires domain specific knowledge, methods, and techniques (Facione, 1990).

By creating independent life-long learners, the aims of postsecondary educational institutions are fulfilled in that students make a greater contribution to the workforce and are more productive citizens (Kurfiss, 1988; Tsui, 2002). Higher levels of intellectual development that accompany critical thinking skills enable graduates to continue to contribute to society after their content knowledge has become out of date or irrelevant to their daily lives (Bernstein, Marx, & Bender, 2004).

While theories associate late adolescence and adulthood with advanced stages of cognitive development (Piaget, 1964; Perry 1981; Kitchener & King, 1984), evidence suggests that close to half of entering college students are not operating at advanced stages of cognitive development and that postsecondary education plays a key role in exposing students to experiences that encourage development (Pascarella & Terenzini, 1991). Because postsecondary institutions are increasingly called upon to impart knowledge that is discipline-based but also foster higher order thinking skills that can be employed in academic as well as non-academic settings (AASC&U, 2005; Pascarella & Terenzini, 1991) the educational community has responded by devoting a considerable amount of attention to fostering the critical thinking skills among students (Tsui, 2000).

DEFINING AND OPERATIONALIZING CRITICAL THINKING

Cognitive development theory provides a framework for understanding the importance of critical thinking. The theories help conceptualize how critical thinking facilitates intellectual growth and the ways in which critical thinking skills

are linked to achieving educational goals. However, defining and operationalizing the term 'critical thinking' has been met with less consistency.

John Dewey briefly defines critical thinking as “active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tends” (Dewey, 1933, p. 118). More recent definitions for the term capture the manner in which critical thinking is interpreted as both a mode of thinking as well as a set of behaviors (Cheung, Rudowicz, Kwan, & Yue, 2002; Educational Testing Service [ETS], 2002; Facione, 1990; National Council for Excellence in Critical Thinking Instruction, 2006).

Conceptualizing critical thinking as both a set of cognitive skills as well as affective dispositions is illustrated by the American Psychological Association (APA) statement (Facione, 1990). The APA defines critical thinking as “purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based.” These cognitive skills are essential for inquiry and the ideal critical thinker is:

“habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit” (Facione, 1990).

The National Council for Excellence in Critical Thinking Instruction defines critical thinking as “that mode of thinking - about any subject, content, or problem - in which the thinker improves the quality of his or her thinking by skillfully taking charge of the structures inherent in thinking and imposing intellectual standards upon them”. Furthermore, a “well cultivated critical thinker”:

- Raises vital questions and problems, formulating them clearly and precisely;
- Gathers and assesses relevant information, using abstract ideas to interpret information effectively comes to well-reasoned conclusions and solutions, testing them against relevant criteria and standards;
- Thinks open-mindedly within alternative systems of thought, recognizing and assessing, as need be, their assumptions, implications, and practical consequences; and

- Communicates effectively with others in figuring out solutions to complex problems (National Council for Excellence in Critical Thinking Instruction, 2006).

Operational definitions for proficiency in critical thinking exist as well. Educational Testing Service (ETS) has developed a set of skills denoting proficiency as measured by the assessment tool *Academic Profile*, including the ability to:

- Evaluate competing causal explanations;
- Evaluate hypotheses for consistency with known facts;
- Determine the relevance of information for evaluating an argument or conclusion;
- Determine whether an artistic interpretation is supported by evidence contained in work;
- Recognize salient features or themes in a work of art;
- Evaluate the appropriateness of procedures for investigating a question of causation;
- Evaluate data for consistency with known facts, hypotheses, or methods; and
- Recognize flaws or inconsistencies in an argument (ETS, 2002).

While there is a great deal of latitude in regard to definitions of critical thinking and how those definitions are applied, several commonalities exist. Throughout the literature, critical thinking is defined an active process which goes beyond basic acquisition and memorization of information in that critical thinking requires the ability to recognize and rationally consider multiple concepts or elements which constitute a body of thought. New information is compared with currently held assumptions and assimilated so that one can make reasonable deductions or devise a plan of action (Bowell & Kemp, 2002; Hagerdorn, Pascarella, Edison, Braxton, Nora, & Terenzini, 1991; Kurfiss, 1988).

Gleaned from these commonalities, UMUC defines critical thinking as the ability to “demonstrate the use of analytical skills and reflective processing of information.” In looking to assess whether students are capable of demonstrating critical thinking skills, UMUC has identified several key expected outcomes for the School of Undergraduate Studies (SUS) and the Graduate School of Management and Technology (GSMT).

Within SUS, proficiency in critical thinking is demonstrated through the through the ability to:

- Determine the nature and extent of information needed;
- Evaluate information and sources critically;

- Incorporate information into a personal knowledge base;
- Support positions with credible reasoning and evidence;
- Use information effectively to accomplish a specific purpose; and
- Use information ethically and legally (UMUCa, 2005).

Within, GSMT proficiency in critical thinking is demonstrated through the ability to:

- Develop credible responses to complex questions;
- Gather appropriate evidence;
- Evaluate alternative solutions with respect to evidence; and
- Choose the solution that best fits the evidence (UMUCb, 2005).

The UMUC definition clearly associates critical thinking skills with the ability to analyze and synthesize information to solve problems in a broad range of areas. Should UMUC decide to review the current definition of critical thinking, several considerations may be worthwhile. For instance, the ability to raise and solve complex questions is an important component of critical thinking. The current UMUC definition does not speak to the process involved in considering different hypotheses, whether the hypotheses are viable given the information presented, and how deductions derived through these processes impact current systems of thought.

STUDIES ASSOCIATED WITH THE DEVELOPMENT OF CRITICAL THINKING SKILLS IN POSTSECONDARY INSTITUTIONS

Developing critical thinking skills among students enrolled in college and universities is underscored by several studies (Kitchener & King, 1984). While the exposure to postsecondary education is important, a meta-analysis of the literature reveals the manner in which students interact and are introduced to subject specific information is a fundamental part of and plays a vital role in developing critical thinking skills (Pascarella & Terenzini, 1991; Steele, 1986).

The amount of formal education, net of age and intelligence, was positively associated with the overall quality and complexity with which students were able to reason, develop, and support arguments. For instance, significantly greater gains in complex reasoning and judgment were found among students who attained a bachelor's degree when compared to peers with similar prior academic preparation and intelligence who did not attend college (Kitchener & King, 1984). Furthermore, courses and experiences which promote critical thinking skills are linked to increased cognitive development as measured by IQ scores (Pascarella & Terenzini, 1991; Sternberg, 1986).

More specifically, first-year to senior-year differences on measures of critical thinking are attributable to the college experience when controlling for academic aptitude prior to enrollment, age, maturation and socioeconomic status (Steele, 1986). For example, compared to entering students, seniors who demonstrate advanced reasoning are more adept at applying information to address complex problems and can develop more sophisticated abstract frameworks to deal with issues (Pascarella & Terenzini, 1991).

Emphasizing the development of critical thinking skills has positive implications for the immediate learning environment as well. Students who are exposed to classroom environments that foster critical thinking skills begin to see themselves as active contributors to the learning process (Tsui, 2000). Exploring viable solutions to complex problems with peers and constructing knowledge alongside professors and instructors allows students to situate themselves within the learning process thereby encouraging development of higher order cognitive processes and mastery of subject matter (Tsui, 2000).

Colleges that impart a sense of the students as a participant in a community of scholars which encourages analysis, discussion, and reflection ultimately create environments which encourage high order cognitive processes, including the ability to think critically (Pascarella & Terenzini, 1991). For instance, distance learning environments which employ Socratic questioning, a pedagogical technique used to foster class discussions, allow students time for “analysis, negotiation, and reflection and allows instructors to model and evaluate the critical thinking skills exhibited during discussion” and leads to measurable gains in college students’ critical thinking skills (Yang, Newby, & Bill, 2005).

ISSUES SURROUNDING IDENTIFICATION AND ASSESSMENT

Developing critical thinking skills among students may be university-wide goal, however, the faculty are primarily charged with carrying out the task through individual course assignments. Studies highlight a degree of confusion among faculty in regard to what constitutes critical thinking, what classroom activities are best employed to encourage development, and how to assess whether those skills have been attained (Paul, Elder, & Bartell, 1998).

Interestingly enough, 93% of faculty in the nationally administered *Faculty Survey of Student Engagement* report structuring classes so that students learn and develop positively in the area of critical and creative thinking (AAC&U, 2004). Despite the attention among faculty to design classes that advance critical thinking skills, perceptions among students are more mixed. Fifty-one percent (51%) of students who participated in the *2004 National Survey of Student Engagement* reported that college contributed to critical thinking skills very much and 37% reported quite a bit (28% some, and 7% very little) (AAC&U, 2004).

Other national assessments such the 2003-2004 *Academic Profile* produced by the Educational Testing Service seek to capture student proficiency in critical thinking. Results reveal that 6% of college seniors were proficient in critical thinking while 77% were not proficient (AAC&U, 2004).

Mixed perceptions in regard to what fosters critical thinking skills may be due in part to the multifaceted nature of the identifiable skills which frame the concept (Erwin & Sebrell, 2003; Halpern, 2001). Difficulties also arise as studies have demonstrated identifying improvements in critical thinking as a direct result of instruction is a complex and unwieldy task (Erwin & Sebrell, 2003; Halpern, 2001). Although course objectives may be created with the growth in critical thinking as a desired outcome several variables make assessing which factors contribute to learning outcomes difficult. For instance, course content, instructional format, and student interaction with content, peers and instructors may vary and each play a vital role in facilitating intellectual development (Bullen, 1998; Williams, 2004). Furthermore, gains in critical thinking and associated cognitive development are a cumulative and gradual process making them difficult to capture (Halpern, 2001).

Attention to critical thinking as an important outcome of postsecondary education has implications in regard to how the teaching and learning process is conceptualized. Likewise, the assessment methods that are employed to determine the degree of proficiency in critical thinking achieved as a result of exposure to instructional activities is also an important consideration (Halpern, 1998).

Different definitions of critical thinking are reflected in different approaches to assessing critical thinking (Bers, 2005). Bers (2005) highlights several standardized tests that have been developed to test critical thinking skills:

- *Academic Profile*, developed by ETS, now named the *Measure of Academic Proficiency and Progress Test*, examines critical thinking skills in three areas: humanities, social sciences, and natural sciences. Criterion-referenced and norm-referenced scores are reported.
- *California Critical Thinking Dispositions Inventory (CCTDI)* available through Insight Assessment assesses students' internal motivation to use critical thinking skills to solve problems and make decisions.
- *California Critical Thinking Skills Test (CCTST)* available from Insight Assessment assesses critical thinking and reasoning skills yielding scores on inductive and deductive reasoning, analysis, inference, and evaluation.
- *College BASE* developed at the University of Missouri-Columbia assesses knowledge garnered from course materials in specific subjects such as English, mathematics, science, and social studies.

- *Collegiate Assessment of Academic Proficiency (CAAP)* produced by the ACT measures five general education skill areas including critical thinking.
- *Collegiate Learning Assessment Project (CLA)* developed by the Rand Corporation's Council for Aid to Education assesses students' ability to identify strengths and weaknesses of various arguments.
- *Tasks in Critical Thinking* developed by the Educational Testing Service and the College Board assess problem-solving skills in subject-specific areas. The test is performance-based and generates group scores.
- *Test of Everyday Reasoning* produced by Insight Assessment assesses reasoning skills such as analysis, inference, and evaluation (Bers, 2005).

After soliciting input from various stakeholders, UMUC selected the *Measure of Academic Proficiency and Progress (MAPP)* to assess students' proficiency in critical thinking skills. The results may be used to improve the quality of instruction and learning because the MAPP is designed to assess academic skills related to critical thinking rather than knowledge in specific areas. UMUC was given the opportunity to work closely with ETS to produce the test, ensuring the assessment is designed to measure the institution's general education outcomes. An additional consideration in selection of the MAPP includes the format the results are reported in. Institution specific scores are provided as well as standardized norms that allow comparison with over 400 institutions nationally (ETS, 2002).

DEVELOPING CRITICAL THINKING THROUGH CURRICULUM AND TEACHING BEST PRACTICES

The literature suggests several general best practices that can be employed by colleges and university faculty that will serve to encourage critical thinking among students:

- Critical thinking is not the topic of one course or one major; critical thinking should be a component that is infused in all courses so that students are exposed to experiences that facilitate development of high order thinking skills that can be applied to across disciplines (Halpern, 1998; Paul & Nosich, 1993).
- Learning environments that encourage critical thinking promote active learning through frequent questions and provide enough support to allow students to challenge their current conceptions of knowledge and interact with other students (Browne & Freeman, 2000).
- Pedagogy based in an understanding of cognitive psychology is important for enhancing higher order thinking skills among students. Understanding the ways in which learners approach information and

ideas and organize knowledge is important to the success of teaching methods designed to shape the cognitive processes of students (Halpern, 1998).

- A skills based approach that targets specific abilities students should master at the conclusion of a lesson is one approach to critical thinking instruction. Designing instruction so that objectives are increasingly complex and lead students from one stage to another allows for specificity and structure. An important part of instruction designed to encourage critical thinking skills is to have students successfully use the strategy but also recognize opportunities to transfer that skill in new and less well-defined situations (Halpern, 1998).
- Institutions should stress the importance of including critical thinking as a measure of student learning at the graduate and undergraduate level. Due to the complexity of the task, an operational definition of critical thinking is essential to framing the assessment of critical thinking skills. Furthermore, course objectives and goals targeted at development of critical thinking should be a key component of the curriculum as well as the assessment process (Giancarlo & Facione, 2001; Halpern, 2001).
- Institutions should select assessment tools that target skills, abilities, and affective dimensions associated with the operational definition of critical thinking, as well as tools that can provide institutions with useable information in regard to accomplishments (Paul & Nosich, 1993).

Examining critical thinking as a core academic skill highlights the importance of developing higher level cognitive processes so that multiple educational outcomes are accomplished. Cognitive development theory highlights how critical thinking is facilitated through learning environments that emphasize and incorporate pedagogy and educational experiences that encourage progression to advance stages of intellectual development. Encouraging critical thinking allows students to acquire and utilize discipline specific information as well as synthesize that information with previously held knowledge in a variety of contexts within the immediate learning environment. Critical thinking skills also allow students to contribute to society and solve problems that fall outside of discipline specific areas.

Developing critical thinking skills is an important task that requires a consistent application of efforts specifically designed to facilitate these skills among students across disciplines. One important component of these efforts is an institution-specific definition that captures and operationalizes what critical thinking skills mean within the institutional learning environment. As studies have shown, defining and measuring critical thinking is influenced by multiple variables. However, a consistent definition of critical thinking skills that is linked to a carefully orchestrated assessment process is an important consideration.

An assessment process that is linked to individual course objectives and that also provides useful feedback to faculty and university administrators is an important part of institution-wide efforts to accomplish goals related to developing critical thinking skills among students. Such an assessment process can allow for continued attention and provide for focused efforts that ultimately will create learning environments which ensure development of critical thinking among students.

References

- American Association of State Colleges and Universities (2005). *Renewing the promise: The public's universities in a transforming world*. Washington, DC: American Association of State Colleges and Universities.
- American Library Association (1989). *Information power: Building partnerships for learning*. Chicago: American Library Association.
- Anderson, L. W., Krathwohl, D. R., & Bloom, B. S. (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. NY: Longman.
- Association of American Colleges and Universities (1985). *Integrity in the college curriculum*. Washington, DC: Association of American Colleges and Universities.
- Association of American Colleges and Universities (2004). *Liberal education outcomes: A preliminary report on student achievement in college*. Washington, DC: Association of American Colleges and Universities.
- Bernstein, D., Marx, M. S., & Bender, H. (2004). Disciplining the minds of students. *Change*, 37(2), 36-42.
- Bers, T. (2005). Assessing critical thinking in community colleges. *New Directions for Community Colleges*, 130, 15-25.
- Bowell, T. & Kemp, G. (2002). *Critical thinking: A concise guide*. NY: Routledge.
- Breivik, P. S. (2005). 21st Century learning and information literacy. *Change*, March/April, 21-29.
- Browne, M. N. and Freeman, K. (2000). Distinguishing features of critical thinking classrooms. *Teaching in Higher Education*, 5(3), 301-309.
- Bullen, M. (1998). Participation and critical thinking in online university distance education. *Journal of Distance Education*, 13(2), 1-32.
- Cheung, C., Rudowicz, E., Kwan, A. S., & Yue, X. (2002). Assessing university students' general and specific critical thinking. *College Student Journal*, 36(4), 504-525.
- Dewey, J. (1933). *How we think: A restatement of the relation of reflective thinking to the educative process*. Boston: D.C. Heath.

- Educational Testing Service (2002). *The Academic Profile faculty information booklet*. Retrieved March 1, 2006, from http://www.ets.org/Media/Tests/Academic_Profile/pdf/Academic%20Profile%20-%20Faculty%20Information%20Booklet.pdf
- Erwin, T. D., & Sebrell, K. W. (2003). Assessment of critical thinking: ETS's tasks in critical thinking. *The Journal of General Education*, 52(1), 50-71.
- Facione, P. A. (1990). *Critical thinking: A statement of expert consensus for purposes of educational assessment and instruction*. Millbrae, CA: The California Academic Press.
- Giancarlo, C. A. & Facione, P. A. (2001). A look across four years at the disposition toward critical thinking among undergraduate students. *The Journal of General Education*, 50(1), 29-54.
- Hagerdorn, L. S., Pascarella, E. T., Edison, M., Braxton, J., Nora, A., & Terenzini, P. T. (1999). Institutional context and the development of critical thinking: A research note. *The Review of Higher Education*, 22(3), 265-285.
- Halpern, D. F. (1998). Teaching critical thinking for transfer across domains. *American Psychologist*, 53(4), 449-456.
- Halpern, D. F. (2001). Assessing the effectiveness of critical thinking instruction. *The Journal of General Education*, 50(4), 270-287.
- Kitchener, K. S. & King, P. M. (1984). The reflective judgment model: Ten years of research. In M. L. Commons, C. Armon, L. Kohnberg, F. A. Richards, T. A. Grotzer, and J. Sinnott. (Eds.), *Beyond formal operations III: Models and methods in the study of adolescent and adult thought*. (pp.2-29). NY: Praeger.
- Kurfiss, J. G. (1988). *Critical thinking: Theory, research, practice, and possibilities*. ASHE-ERIC Higher Education Research Report No. 2. Washington, DC: The George Washington University, Graduate School of Education and Human Development.
- Middle States Commission on Higher Education (2002). *Characteristics of excellence in higher education: Eligibility requirements and standards for accreditation*. Philadelphia, PA: Middle States Commission on Higher Education.
- National Council for Excellence in Critical Thinking Instruction (2006). Retrieved February 27, 2006, from <http://www.criticalthinking.org>

- National Education Goals Panel (1991). *The national education goals panel: Building a nation of learners*. Retrieved February 27, 2006, from <http://govinfo.library.unt.edu/negp/index-1.htm>
- National Institute of Education Study Group (1984). *Involvement in learning: Realizing the potential of American higher education*. Washington, DC: National Institute of Education, US Department of Education.
- National Science Board (2006). *Science and engineering indicators, Vol. 1*. Arlington, VA: National Science Foundation.
- Pascarella, P. T. & Terenzini, E. T. (1991). *How college affects students*. San Francisco: Jossey-Bass.
- Paul, R. (2005). The state of critical thinking today. *New directions for community colleges*, 130, 27-40.
- Paul, R., Elder, L., & Bartell, T. (1998). *Study of 38 public universities and 28 private universities to determine faculty emphasis on critical thinking instruction*. Retrieved February 27, 2006, from <http://www.criticalthinking.org/aboutCT/Research.shtml#study>
- Paul, R. & Nosich, G. M. (1993). *A model for the national assessment of higher order thinking*. Retrieved February 26, 2006, from <http://www.criticalthinking.org/resources/articles/a-model-national-assessment-hot.shtml>
- Perry, W. G. (1981). Cognitive and ethical growth: The making of meaning. In A. W. Chickering (Ed.), *The modern American college: Responding to the new realities of diverse students and a changing society* (pp.76-116). San Francisco: Jossey-Bass.
- Piaget, J. (1964). Cognitive skills and intellectual growth. In P. T. Pascarella & E. T. Terenzini (Eds.), *How college affects students* (pp. 114-122). San Francisco: Jossey-Bass.
- Tsui, L. (2000). Effects of campus culture on students' critical thinking. *The Review of Higher Education*, 23(4), 421-441.
- Tsui, L. (2002). Fostering critical thinking through effective pedagogy: Evidence from four institutional case studies. *Journal of Higher Education*, 73(6), 740-763.

- Steele, J. M. (1986). *Assessing reasoning and communicating skills in college*. Retrieved March 22, 2006, from the ERIC Document Reproduction Services.
- Sternberg, R. J. (1986). *Intelligence applied: Understanding and increasing your intellectual skills*. San Diego: Harcourt.
- University of Maryland University College (2005a). *School of Undergraduate Studies Learning Assessment Plan*. Adelphi, MD: Office of Outcomes Assessment.
- University of Maryland University College (2005b). *Graduate School of Management and Technology Learning Assessment Plan*. Adelphi, MD: Office of Outcomes Assessment.
- Williams, O. (2004). Psychological versus generic critical thinking as predictors and outcomes measures in a large undergraduate human development course. *The Journal of General Education*, 53(1), 37-59.
- Yang, Y., Newby, T. J., & Bill, R. L. (2005). Using Socratic questioning to promote critical thinking skills through asynchronous discussion forums in distance learning environments. *The American Journal of Distance Education*, 19(3), 163-181.

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