

## *Critical Thinking Skills: Definitions, Assessments, and Teaching Practices*

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### **Abstract**

This paper provides a better understanding of CT skills: focusing on the ways in which CT has been defined, on the ways in which teachers can foster CT in their students through teaching and assessment practices for CT, and on connections between CT and creativity. The main part of the paper consists of four major sections: (1) defining CT skills (CT is generally a self-regulated process of reasoning that is defined as an individual making a judgment of conclusions on a special purpose); (2) teaching and assessing CT skills (creative ways of thinking, as well as CT skills, are “teachable,” though many view these skills as intuitive); (3) findings from CT research studies (in the 21st century, the new and emerging technologies have changed learning from restrictive to flexible, accessible, and innovative approaches; and problem-based learning is a learner-centered, contextualized approach); and (4) creativity and CT skills (creative thinking can be defined as the entire set of cognitive activities, and creative thinking is generally correlated with CT and with problem solving). As a final point, enhancing CT skills promotes the learning process, especially the cognitive processes of learning, and promotes teaching students how to think rather than what to think, as well. Equipped with the information from this presentation, educators can apply instruction in CT skills to their institution’s missions as a whole; and provide a more transformative educational experience for their students.

Keywords: Critical thinking, creativity, 21st century skills, the 4Cs, undergraduate education

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## Introduction

“Employers, educational policymakers, and others are calling on schools and colleges to develop the 21st century skills, such as teamwork, problem-solving, and self-management, that are seen as valuable for success in the workplace, citizenship, and family life” (Hilton, 2015, p. 63). “Educators have long been aware of the importance of critical thinking skills as an outcome of student learning” (Lai, 2011, p. 4): “More recently, the Partnership for 21st Century Skills has identified critical thinking as one of several learning and innovation skills necessary to prepare students for post-secondary education and the workforce” (p. 4). The Partnership for 21st Century Skills—a nonprofit association of education and business leaders based in Washington, D.C.—was founded in 2001 to serve as a catalyst in the 21st century education movement.

California is one of the 19 States that are working together with the Partnership for 21st Century Skills. The Framework of the Partnership for 21st Century Skills describes the skills, knowledge, and expertise that students must master to succeed in life and work: it is a blend of content knowledge specific skills, expertise, and literacies (California Department of Education, 2016). In 1980, the 19-campus California State University instituted a graduation requirement in critical thinking intended to achieve the following goal (Paul, 1984): “An understanding of the relationship of language to logic, leading to the ability to analyze, criticize, and advocate ideas, to reason inductively and deductively, and to reach factual or judgmental conclusions based on sound inferences drawn from unambiguous statements of knowledge or belief” (p. 5).

As the United States move toward a technology-based economy facing worldwide competition, employers demand their workers who can think flexibly, critically, and analytically, integrating information from a variety of sources and perspectives (Reed, 1998). Therefore, “A key employability skill that is widely acknowledged as important for all sectors of education is the ability for students to think critically. The analysis of knowledge requires critical thinking, which in turn involves processing the meaning and significance of observed experiences or expressed inferences” (Nilson, Fetherston, McMurray, & Fetherston, 2013, p. 1).

“The term ‘critical thinking’ is used quite commonly, but how many people (including teachers) can articulate a reasonable conception of critical thinking or detail how they use it in any part of their lives?” (Elder, 2017, p. 42). “Despite widespread recognition of its importance, there is a notable lack of consensus regarding the definition of critical thinking” (Lai, 2011, p. 4). It is true that the concept of critical thinking, like the concept of education, has been defined in different ways by different individuals (Sunday, 2012). Further, “When linked to cooperative behaviors and attitudes, critical thinking becomes even more complex to define and to operationalize” (Daniel et al., 2003–2004, p. 3). To address challenges in teaching critical thinking, it is useful to know the following: “As far as cognitive psychologists are concerned, critical thinking doesn’t come easily for anyone. Studies continue to illuminate the fact that, indeed, very little critical thinking instruction is

occurring at any level in any educational institutions in any countries to any significant degree” (Elder, 2017, p. 42).

This literature review therefore seeks to achieve a better understanding of critical thinking skills: focusing on the ways in which critical thinking has been defined by educators, on the ways in which teachers can foster critical thinking in their students through effective teaching and assessment practices for critical thinking, and on connections between critical thinking and creativity, from a variety of perspectives on the nature of critical thinking. Equipped with this information, faculty can apply instruction in critical thinking skills to their institution’s missions as a whole; and provide a more transformative educational experience for their students.

## **The Current Literature on Critical Thinking Education**

### ***Defining Critical Thinking***

Pointing out that critical thinking is generally not encouraged in elementary and secondary schools but it becomes a central responsibility for higher education, Kurfiss (1988) identifies three perspectives dominating literature on critical thinking for college students: (1) *argument skills* (to detect and avoid fallacious reasoning and to analyze deductive and inductive arguments); (2) *cognitive processes* (for the organization of knowledge in memory and its role in tasks such as reading, writing, and problem solving); and (3) *intellectual development* (for the mature epistemology of commitment, not isolated analytical skills, that is recognized as the true aim of instruction for critical thinking). “Problem solving skills can be considered as one of the key skills that individuals need to acquire for attaining achievement in their personal, social, and working life” (Akınoğlu & Karsantik, 2016, p. 62). The vital role of higher education is “to develop greater reasoning skills in order to cope with and make decisions about life and society, then critical thinking plays a central position, since reasoning is impossible without critical thinking” (Kurfiss, 1988, p. xv) and “the importance critical thinking plays in the education process depends upon one’s philosophic belief in the purpose of education” (p. xv).

Florence (2014), on the other hand, defines critical thinking as a combination of reflective thinking, and engaging in activities with reflective skepticism, using logic, dialogical reasoning, and assessment of criteria: “as the ability of one to reasonably and reflectively interpret, analyze, infer, and evaluate a situation in order to respond” (p. 353). As noted by Florence, the critical thinking movement in contemporary higher education may seem new; however, “Socrates’s observation that the unexamined life is not worth living, expressed time-honored concerns about questioning one’s assumptions: concerns comparable to the current focus on critical thinking and “the assumptions that propel the actions and words of a person” (p. 353).

Given that philosophy is thinking, “probably no discipline has more to do with thinking than does the discipline of philosophy” (Beyer, 1990, p. 55). Socrates, one of the founders of Western philosophy, argued “for the advancement of human rationality through newly developing conceptual tools. The people and the intellectual

world did not embrace criticality, nor even see the need for it, on any broad scale. The same is true today” (Elder, 2017, p. 42).

As described by Moore (2013), “In contemporary debates about the nature of higher education, a concept that looms particularly large is the idea of critical thinking” (p. 506); however, “While there is broad agreement about the importance of critical thinking as an educational ideal, a view often expressed in the literature is that academics are not always so clear about what the concept means, and also not so certain about how the idea is best conveyed to students in their studies” (p. 56). Based on ideas about critical thinking from academics in the three disciplines in Moore’s study (history, philosophy, and cultural studies), Moore categorized seven definitional strands in informants’ comments: critical thinking (1) as judgment (“Being critical, it’s about taking a stand. You have to commit as a critic,” p. 510); (2) as a skeptical and provisional view of knowledge; (3) as original thinking (“A critical thinker has to argue on the basis of the critical thought,” p. 513); (4) as a careful and sensitive reading of text; (5) as rationality (“There is a sense that to some extent all intellectual work is engagement with a rational project,” p. 516); (6) as adopting an ethical and activist stance; and (7) as self-reflexivity (“Knowledge of whatever is a much more fraught process than we might initially think,” p. 518). And this multiplicity of meanings has perhaps important implications for higher education.

Critical thinking “is a self-regulated process of reasoning that is defined as an individual making a judgment of conclusions by questioning, affirmation, approval and correction in the process of cognitive activities focused on a special purpose” (Demirtas & Arslan, 2016, p. 277). Specially, “In this process, the individual makes a decision based on logical criteria conceptually and methodologically in demonstrating evidence through interpretation, analysis, evaluation, and inference. It is a powerful resource that people can use in education, private, and everyday life” (p. 277). “In the strong sense, critical thinking skills are understood as a set of integrated macro-logical skills ultimately intrinsic to the character of the person and to insight into one’s own cognitive and affective processes” (Paul, 1984, p. 5).

### ***Teaching and Assessing Critical Thinking***

“Information technology is so pervasive that education as we know it has changed considerably. With renewed vigor, educators all over the world are grappling with the immense learning challenges and myriad opportunities that come with life in the 21st century” (Hernandez, 2017, ¶1) and “At the higher-education level, the quest for relevance is deeply pronounced. Innovation and development in the workplace have outpaced the efforts of universities to develop courses that can prepare their learners for the competency demands of jobs and careers that have yet to be created” (¶2). Hernandez further states that acquiring the 3Rs (*reading, writing, and arithmetic* that are the foundations of a skill) has no longer been enough since the late 1900s, and the essential skills for success in today’s world, especially college and career readiness and global citizenship, include the following learning and innovation skills (recognized as the 4Cs: *critical thinking, communication, collaboration, and creativity*).

Certainly, it is so that “The 21st century is a new era, where we learn in new ways, create new things, and depend on each other for new partnerships. . . The 21st century university must become something new” (Rao, 2016, p. 109). Accordingly, as emphasized by Weissberg (2011), “American universities have a responsibility to teach more than what the course syllabus demands” (p. 222). This statement offers support to Hetland’s (2013) argument below:

*Schools often seem to default to a vision of education as knowledge acquisition, which the fervor for testing has only exacerbated; students “succeed” when they can reproduce knowledge on demand from memory. No one should belittle the importance of knowledge—it’s an essential component of wisdom and raw material for constructing what society needs and values. But if education focuses primarily on knowledge acquisition, students are unlikely to learn to behave as democratic citizens must—that is, as active, informed, ethical participants in shaping our collective futures. (p. 67)*

As emphasized by Suarez-Orozco and Sattin (2007), “Information, communication, and media technologies are the high-octane fuel that drives global interdependence, as people across the world connect with one another instantaneously. These communication networks and the digitization of data have another global effect with deep consequences for formal education” (p. 60) and, at the same time, “... advanced technological skills are no longer optional for students in the 21st century. Schools must embed technology across the curriculum and view mastery of technology alongside literacy and numeracy as skills required of all graduates” (p. 62).

Perhaps future employment might be the most quantifiable goal of education in general (Keane, 2016), and so, “If we cannot encourage innovative and creative ways of thinking, or train our children to revisit forgotten ones, all the technology training in the world is just so much tilting at windmills” (p. 12). Creative ways of thinking, as well as critical thinking skills, are “teachable,” though many view these skills as intuitive (Newbill & Baum, 2012–2013): “Using technology such as the internet, webcams, speakers, computers, smartphones, Wii Fit boards, and projectors, students and teachers built their own critical- and creative thinking skills” (p. 19).

Ritchhart and Perkins (2008) offer six principles which anchor Visible Thinking and characterize instructional approaches: (1) learning is a consequence of thinking; (2) good thinking is not only a matter of skills but also a matter of dispositions; (3) the development of thinking is a social endeavor; (4) fostering thinking requires making thinking visible; (5) classroom culture sets the tone for learning and shapes what is learned; and (6) schools must be cultures of thinking for teachers. Visible Thinking focuses on such core practices as thinking routines, the documentation of student thinking, and reflective professional practice (Rodwan & El-Ashri, 2012): Visible Thinking “was originally developed at Lemshaga Akademi in Sweden as part of the Innovating with Intelligence project and focused on developing students’ thinking dispositions in such areas as truth-seeking, understanding, fairness, and imagination” (p. 15).

“Schools and colleges need to enable people to be more critical in their thinking, precisely by preparing them to be more skeptical towards commonly accepted truisms and by situating what is presented as knowledge in its necessarily relational and moral contexts” (Lim, 2015, p. 18). Emphasizing that “virtually everyone would agree that a primary, yet insufficiently met, goal of schooling is to enable students to think critically” (p. 8), Willingham (2007) argues that although there is no one set of critical thinking skills that can be acquired and deployed regardless of context, there are metacognitive strategies that make critical thinking more likely, and the ability to think critically depends on domain knowledge and practice.

“To promote thinking in children, teachers must themselves be intentional in their practices and diligent about evaluating their effectiveness. It helps to plan and reflect with another person who is familiar with the students and classroom schedule” (Epstein, 2008, p. 40): therefore, “many prekindergarten programs use a team-teaching model, which not only benefits the students, but also contributes to the professional development of thinking practitioners. Team planning is most effective when teachers share objective anecdotal notes about children” (p. 40).

The emphasis on performance in dance education, for instance, “often leaves little room for thorough and critical consideration of other aspects of dance as an academic discipline” (Amin, 2016, p. 15): in pathways to critical pedagogy in dance education, “Critical pedagogy views teaching and learning as a conversation among teachers and students, using the knowledge students enter the classroom with as an intentional pathway to learning new concepts” (p. 24).

“The idea of ‘teaching it directly’ suggests that the best approach to helping students develop critical thinking is through explicit instruction—not as a standalone endeavor, but within respective fields of knowledge” (Goodwin, 2017, p. 81). “What may be more useful is to explicitly introduce students to the language of logic and reason, providing them with an approach to analyze their own and others’ thinking” (Goodwin, 2014, p. 80). Ideally, “effective thinking is a trait that is valued by schools at all levels; however, it is a skill that is very rarely taught. Teaching thinking skills explicitly and embedding them into a literacy curriculum can help students become more effective critical and creative thinkers” (Johnson, 2002, p. 3).

### ***Findings from Critical Thinking Studies***

A study by Vashe et al. (2016) identified improvements in 229 students’ uses of critical thinking in physiology. Instead of using a surface learning approach (multiple-choice questions for assessing student performance), this longitudinal study employed a hybrid approach: a variety of teaching methods that included didactic lecture classes, self-directed learning, and problem-based learning. As a result, the researchers observed a significant increase in critical thinking by the completion of the course, as compared with their performance on the pre-test.

“Traditionally, learning took place when instructors and students were in the classroom at the same time. . . . In the 21st century, the new and emerging electronic

learning technologies (e-learning) have changed learning from restrictive to flexible, accessible, and innovative approaches” (Tseng, Gardner, & Yeh, 2016, pp. 15–16). Problem-based learning, as noted by Tseng et al., is a learner-centered, contextualized approach: “In this approach, learning begins with a problem to be solved rather than content to be mastered. Learners work on problems in ways that require them to develop expert knowledge, problem-solving proficiency, lifelong learning skills, and team participation skills” (p. 17). “Actually, it is one of the most innovative instruction methods in the history of education in which an authentic or ill structured problem is presented to students to embed them into the learning process by building new knowledge onto the previous one in order to solve the problem itself” (Birgili, 2015, p. 75).

Three currently nationally recognized and validated critical-thinking assessment instruments are as follows: the California Critical Thinking Skills Test (CCTST), the California Critical Thinking Disposition Inventory (CCTDI), and the Health Science Reasoning Test (HSRT) (Cone et al., 2016). A study by Cone et al. was to determine if HSRT results improved in second-year student pharmacists after exposure to an explicit curriculum designed to develop critical thinking skills. In the first year, students (N = 83) attended a 16-week laboratory curriculum in which simulation, formative feedback, and clinical reasoning were used as teaching strategies. Then students took the HSRT and significant improvement in HSRT scores occurred among students. Cone et al. found that the laboratory curriculum based on the following 5-phase experiential learning cycle was particularly effective in developing students’ critical thinking skills: Phase 1—the dialogue of experience, which introduced the topic to students; Phase 2—a participative simulation-based learning experience; Phase 3—processing the learning experience, in which students worked on content definitions and explanations; Phase 4—generalizing from the lessons learned, to summarize the knowledge; and Phase 5—clinical application, to personalize the experiences, and to link learning experiences to goals, with evaluations of results. Repeating the 5-phase framework ensured sustainability of the students’ developing critical thinking skills.

A study by Huang, Lindell, Jaffe, and Sullivan (2016) identified the strategies of faculty teaching critical thinking, using semi-structured interviews to answer the questions: What approaches do faculty recognized by their peers as good teachers in critical thinking use to teach critical thinking? How explicit is this teaching? A total of 291 medical and nursing faculty at eight institutions participated in the online survey. The findings were organized into themes of “what” faculty teach to learners (e.g., cognitive skills such as higher-order thinking and metacognition), “how” they teach (e.g., guiding principles of clinical relevance and perspective shifting, and concrete strategies such as questioning and group interaction), and “why” they teach critical thinking (e.g., to produce the best possible health outcomes for patients). The teaching strategies the authors recommend include: be explicit about the thinking process; use questions to probe underlying thinking; apply concepts to other settings; consider different perspectives; engage learners using writing and other media; and leverage group interaction.

Indicating that “lessons that support higher-order thinking are also likely to interest and engage students” (p. 10), Brookhard (2016) has shared three strategies for infusing higher-order thinking into lesson plans: Strategy 1 (craft open questions carefully to make sure they tap the particular content and thinking skills the instructor wants to teach); Strategy 2 (foster students’ thinking, not retelling, because a retelling task asks students merely to look up and reproduce information but without additional cognitive processing); and Strategy 3 (facilitate student Self-Assessment, because students who can self-assess are poised to be lifelong learners. They are poised to use self-regulation strategies and to be their own best coaches as they learn).

What makes a question essential? “Essential questions foster the kinds of inquiries, discussions, and reflections that help learners find meaning in their learning and achieve deeper thought and better quality in their work” (p. 11); moreover, essential questions stimulate ongoing thinking and inquiry; are arguable with multiple plausible answers; and spark discussion and debate (Wiggins & Wilbur, 2015). Hence it is important to provide questions that can stimulate discussions on essential concepts. These discussions allow students to achieve competency in the content area, and to recognize the students’ existing competencies and experience: welcoming and encouraging their participation in the discussion. “Reflective writing,” in particular, “allows students to respond to and ask important questions, to pursue arguments, to defend a point of view, to accept antagonistic views, and to weigh possible alternatives” (Tallent & Barnes, 2015, p. 439). In the same way, “Writing is not simply a vehicle that allows students to express what they know; writing is a tool that generates new thinking” (Gallagher, 2017, p. 26).

### ***Creativity and Critical Thinking Skills***

Educators typically value creativity, but rarely actively promote it. “In recent years, creativity has been valued as universal capability that it can be applied in everyday situations. It is interpreted as capability of human intelligence instead of a subject” (Birgili, 2015, p. 73). Instruction in American classrooms “has tended to skew toward teaching routine tasks that follow a step-by-step process, rather than encouraging complex and creative problem-solving” (Goodwin & Miller, 2013, p. 81). “If there is a growing need for creativity in the workplace, what can teachers do to help students become more creative? Inside the square box of the classroom, how can we help students think outside the box?” (Goodwin & Miller, 2013, p. 80).

Prominent 20th Century educational reformer, John Dewey, valued creativity and characterized ways of promoting it. Dewey’s pragmatic approach to educational thinking “contributed to the development of informal education—education that must engage with and enlarge with experience. He implied the idea that students should be trained not to accept new ideas and ideologies without critical processing and reasoning” (Hosseini, 2010, p. 230).

Creativity is not easily defined because of its unseen character (Lewis, 2005); yet “a view of creativity around which there has been a growing consensus that it is a composite concept, the product not just of individual traits, but also of societal and

environmental factors” (p. 37). Although creative thinking has traditionally been associated with the arts/humanities and critical thinking with the sciences, a brief examination of the evidence suggests the essential nature of both creative and critical thinking within each of the two cultures (Scott & Karakas, n. d.). In general, critical thinking and creative thinking include the following: idea generation, reflective judgment, self-regulation, attitudes, and dispositions (Newbill & Baum, 2012–2013).

In a few words, “creative” thinking is divergent, seeks to create something new, and involves contravening accepted principles; in contrast, “critical” thinking is convergent, seeking to assess worth or validity in something that exists, and is carried on by applying accepted principles (Beyer, cited in Baker & Rudd, 2001). Specifically, in Baker and Rudd’s words, “It does appear that the collegiate educational experience has had little effect upon the students’ ability to be creative or their disposition to think critically” (p. 182) and “Teaching students to remember factual information and return it in the form of an examination is the prevalent teaching mode employed in secondary and post-secondary institutions today” (p. 182).

Creative thinking and critical thinking are often “used interchangeably in definition. In fact, they have different constructs and individuals should approach everyday problems by using both competences (Birgili, 2015): “Creative thinking can be defined as the entire set of cognitive activities used by individuals according to a specific object, problem and condition, or a type of effort toward a particular event and the problem based on the capacity of the individuals” (p. 72). Also, creative thinking is generally correlated with critical thinking and with problem solving. To differentiate them, Birgili has recognized three unique dimensions of creative thinking: (1) *synthesizing* (which includes activities such as deriving benefit from analogous thinking; and deducing an original result from small components); (2) *articulation* (which involves expanding existing knowledge with the help of the new information); and (3) *imagination* (e.g., constructing relationships between valid and reliable thoughts; demonstrating flexibility in thought with the help of imagination). Birgili concludes that problem-based learning requires the use of experience-yielding problems that give learners ample opportunities to apply new information to existing knowledge, and to create innovative solutions.

Piske, Stoltz, Guérios, and de Freitas (2016) emphasize the mutually supporting roles of creativity and imagination: “Creativity is the quality to create, whereas the imagination can be considered as the action to imagine and invent something new,” and thus, “every human being is able to use creativity to solve problems in various ways and discover a range of possibility of solutions for the different areas of knowledge” (p. 2270).

## Conclusion

The newly created Common Core State Standards reflect critical thinking as a cross-disciplinary skill vital for college and employment (Lai, 2011, p. 4). As discussed in the current paper, to succeed in the 21st century, students will need to perform to high standards and acquire mastery of rigorous core subject material (the 3Rs); they will also need to gain life and career skills, learning and innovation skills (the 4Cs), information, media and technology skills (P21, 2017). “Perhaps the biggest recent shift in how information is produced, accessed, and used is the multiplication of information formats that now exist as a result of advances in computing technology and networked systems and communities” (Witek, 2016, p. 24). “Effective use of information technology has arguably equaled skill in reading as a key to thinking about the world and has perhaps even surpassed it as a predictor of success” (Prensky, 2013, p. 23).

The following characteristics of critical thinkers illustrated by Jones and Safrit (1994) are indeed intriguing: appreciates creativity; believes life is full of possibilities; asks questions and challenges answers; associates facts with real life situations; takes risks and is not threatened by failure; accepts others’ viewpoints; is open-minded; generates and evaluates alternative choices; encourages and challenges others to be critical thinkers; and is objective. Chiefly, as described by Su, Ricci, and Mnatsakanian (2016), students with critical thinking skills can determine what information is important and what is irrelevant, identify logical errors but can be open to other points-of-view and reappraise their core values, opinions and knowledge, weigh various facts and identify logical errors, thus helping to solve problems, bring about clarity of perception, vision, and a logical communication method of explanation, and realize that one can select the correct response to any problem or decision that might arise. Accordingly, Su et al. argue that the teacher’s role is to focus on strategies that promote these capabilities.

Forrester (2008) especially emphasizes that “teachers . . . need to employ critical thinking to assess their own teaching methods and their students’ learning styles. . . . Creative and critical thinking skills involve and affect both teachers and learners” (p. 104); in this way, “Education should focus not only on core skills and knowledge but also on teaching and practicing creative and critical thinking skills, because these are the skills that will encourage lifelong learning and personal development” (p. 104). This perspective complements Roberts (2008), who argues that “thinking can be defined, taught, and assessed. More important, creative and coherent thought is an attribute of a lifelong learner. By teaching students to think, we prepare them not only for employment and citizenship, but also for leading abundant lives” (p. 36).

Most 20th century conceptions of learning characterized as teachers as experts and textbooks as primary sources; and emphasized the product. Contemporary approaches to learning characterize teachers as facilitators; a variety of resources and media as contributors; and the importance of the process. In terms of the learning process, formative assessment is essential. Formative assessment with effective feedback by teachers “supports deeper learning and development of transferable competencies,

current educational policies focus on summative assessments that measure mastery of content” (Hilton, 2017, p. 66), and so, “new approaches to teacher preparation and professional development will be needed to help current and prospective teachers understand how to support students’ deeper learning and development of 21st century competencies in the context of mastering core academic content” (p. 66).

As a final point, it is now established that developing and enhancing critical thinking skills will promote the learning process: especially the cognitive processes of learning. In particular, thinking has proven to be “a teachable and learnable skill. . . . Educational systems must focus primarily on teaching youth how to think rather than what to think” (Assaf, 2009, p. 35).

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