



# On the Horizon: the Promise and Power of Higher Order, Critical, and Critical Analytical Thinking

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## Abstract

The information flood—ever present in today’s society—requires students, teachers, and the general public to think at a higher level, critically and analytically. However, higher order, critical, and critical analytic thinking lack practical and precise definitions, and therefore, researchers and practitioners have adopted disparate characterizations of these constructs. This special issue presents a collaboration of international scholars invested in documenting the growth and development of human thinking and reasoning through their different perspectives and disciplinary frameworks. The special issue illustrates the similarities and differences of higher order, critical, and critical analytic thinking from these varied perspectives and frameworks. The final paper integrates these perspectives to sketch a map of higher order, critical, and critical analytic thinking that researchers, educators, and policymakers can use when navigating this conceptual murkiness.

**Keywords** Higher order thinking · Critical thinking · Critical analytic thinking

## Introduction and Background

In his collection of semi-autobiographical essays, *The Mirror of the Sea*, Joseph Conrad (1906) said “the attainment of proficiency, the pushing of your skill with attention to the most delicate shades of excellence, is a matter of vital concern” (p. 37). Conrad was talking about seafaring, and there is little doubt that with today’s scientific and technological advances, traveling across the oceans is a less hazardous undertaking than it was over 100 years ago. Yet, today’s world of sophisticated science and technology has introduced hazards of its own, including the almost instant worldwide transmission of information, including its

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maladaptive and nefarious forms: misinformation, disinformation, and malinformation (Wardle & Derakhshan, 2017). Human thinkers are tasked by this treacherous environment of information disorder, where “changes [are] swifter than the shifting of the clouds reflected in the mirror of the sea” (Conrad, 1906, p. 39). Greater proficiency in human thinking and reflectivity is needed to interpret and achieve the delicate shades of truthful understanding. This special issue attempts to help push us toward a future where the mastheads of higher order, critical, and critical analytical thinking more fully emerge above the horizon to become meaningful and useful constructs for educational research and practice.

Categorizing, characterizing, and ordering human thinking have long been enterprises in education and educational research. For instance, Bloom et al. (1956) published the classic report *Taxonomy of Educational Objectives: The Classification of Educational Goals, Handbook 1 Cognitive Domain*. In the foreword to this document, Bloom et al. explained that they were attempting to apply the concept of a taxonomy common in biological sciences to the construction and assessment of educational objectives. As they wrote:

You are reading about an attempt to build a taxonomy of educational objectives. It is intended to provide for classification of the goals of our educational system. It is expected to be of general help to all teachers, administrators, professional specialists, and research workers who deal with curricular and evaluation problems. It is especially intended to help them discuss these problems with greater precision. (p. 1)

Bloom et al. (1956) were by no means the first to undertake the characterizing and ordering of forms of human thinking based on their quality or complexity. There are contemporary theorists and researchers who have turned to the philosophical writings of Socrates, Plato, Aristotle, Bacon, and Russell in their wrangling as to what qualifies as more basic or more advanced cognitions (Lipman, 1987; Richland & Simms, 2015). Despite Bloom et al.’s (1956) laudable efforts to generate a thinking hierarchy, as well as those of researchers who sought to refine and extend the initial taxonomy (e.g., Anderson & Krathwohl, 2001), a clear, precise, and practical classification of human thinking remains elusive.

One obvious result of the ongoing struggle to map the forms and levels of human cognition accurately is a myriad of often ill-defined, conceptually vague, and overlapping terms meant to distinguish lower or simpler forms of thinking from higher or more complex forms (Toplak & Stanovich, 2002). What educational researchers and practitioners must now confront is a sea of constructs that are perilous to navigate, even for experienced voyagers. Therefore, for this special issue, the authors of each article have chosen to dive head first into the murky waters surrounding three of these cognitive constructs that have become important to educational inquiry and instructional practice globally—higher order, critical, and critical analytic thinking. In this introduction, I offer some past characterizations of higher order, critical, and critical analytical thinking as a way to introduce the research seascape. In doing so, it is not my intent to provide full conceptual clarity, but rather to prepare the way for

the remaining articles in this special issue as they boldly endeavor to conceptualize these constructs from varied perspectives.

### Some Past Characterizations of Human Thinking

Human thinking is often related to, but differentiated from, other cognitive processes, such as perception, attention, and memory (Holyoak & Morrison, 2012). Particularly since the onset of the cognitive revolution in psychology, thinking is often closely aligned with beliefs and with knowledge use, acquisition, and construction (Bloom et al., 1956; Glaser, 1984; Halpern, 2014; Newell & Simon, 1961). For example, in *The Oxford Handbook of Thinking and Reasoning*, Holyoak and Morrison (2012) said “Thinking is the systematic transformation of mental representations of knowledge to characterize actual or possible states of the world” (p. 1). In effect, thinking is a broad term that includes many mental activities such as conceptualizing, remembering, reasoning, deciding, and planning (Rips & Conrad, 1989). It involves recalling or remembering what one already knows, as well as using that knowledge to reason, decide, and plan, among other things.

### Higher Order Thinking

Many have posited that thinking involves a combination of intuitive (e.g., automatic, fast, and unconscious) and reflective (e.g., purposeful, slow, and effortful) processes. Some have proposed that human cognition can be divided into at least two thinking systems, called Type 1 (lower-order, which are rapid and autonomous) and 2 (higher order, which are slow and purposeful) processes (Keren & Schul, 2009). Such dual-process models suggest that human thinking evolved in two phases: (a) Type 1 thinking aligned with instinctive responses and (b) Type 2 thinking aligned with purposive reflection (Evans & Stanovich, 2013). Others have argued against multiple thinking system frameworks and suggested that human thinking is not clearly differentiated, but rather relies on networks that include situation and context, prior knowledge, task objectives, and motivations (Keren & Schul, 2009). For example, Kruglanski et al. (2003) argued that more demanding tasks require greater processing resources, particularly with judgments and decision-making of highly relevant information. In terms of structuring objectives in the cognitive domain, Bloom et al.’s (1956) taxonomy appears to align more into the multiple thinking systems frameworks, where there is a superordinate structure with two divisions in educational objectives: the acquisition of (a) “knowledge or information” (p. 28), which includes remembering or recalling facts or specifics that can be objectively scored (p. 28) and (b) “intellectual abilities and skills” (p. 38), which include comprehension, application, analysis, synthesis, and evaluation.

The articles in this special issue consider Bloom et al.’s (1956) framework, broadly positioning higher order thinking within the division of intellectual skills and abilities. In doing so, they do not abandon the essential importance of knowledge. Bloom et al. (1956) suggested that the classes within their taxonomy represent categories of educational objectives, where one class (e.g., knowledge) probably

makes use of and is built upon “the preceding classes” (p. 18). Although knowledge is distinct from more complex skills and abilities in Bloom et al.’s configuration, revisions to the taxonomy elevated its status by making it a separate dimension marked by four types of knowledge: factual, conceptual, procedural, and metacognitive (Anderson & Krathwohl, 2001). In this way, knowledge is related to the other classes representing higher order thinking, including comprehension, application, analysis, synthesis, and evaluation, as well as reasoning, problem solving, and creativity (Brookhart, 2010; Collins, 2014).

## Critical Thinking

The teaching and learning of critical thinking has been a much sought treasure within the educational enterprise. During this pursuit, there is often a consistent commitment to more explicit and sustained instruction involving critical thinking as a “twenty-first century skill” (Bellanca, 2010; Griffin & Care, 2014; Halpern, 2014; National Research Council, 2011; Rios et al., 2020; Saavedra & Opfer, 2012; Trilling & Fadel, 2009). Greene and Yu (2016) argued that twenty-first century challenges (e.g., the spread of misinformation and disinformation via various social media platforms) demand innovative and creative methods and scaffolds for students to learn when and how to think critically. This may have caused an increased emphasis on teaching for critical thinking in teacher preparation programs and across subjects (Starkey, 2020). However, there has also been great divergence in defining the nature and characteristics of what critical thinking is (Abrami et al., 2008; Lai, 2011).

A long theoretical and empirical history suggests that the relations between critical thinking and knowledge are dynamic. In summarizing various theoretical perspectives that emerged throughout much of the 1900s, Facione et al. (1995) suggested that critical thinking is involved in making purposeful judgments about what to believe and do in a particular situation and context. Ennis (1991) emphasized that “background knowledge is absolutely essential for critical thinking” (p. 18). Willingham (2007) similarly asserted that critical thinking is intertwined with background knowledge. Critical thinking involves higher order thinking processes (e.g., analysis, synthesis, and evaluation) along with knowledge related to—or seemingly related to—the situation at-hand and context involving objects, behaviors, or tasks (Halpern, 2014; Kuhn, 1999). Critical thinking measurement has included dimensions of higher order thinking and knowledge (see, for example, McNamara, 2011). Taken together, these ideas seem to suggest that critical thinking, which involves a complex interplay of higher order thinking and background knowledge, and as such, may then be described as a more focused expression of higher order thinking. Although background knowledge, whether it be factual, conceptual, procedural, or metacognitive, is an integral component of critical thinking, a person’s background knowledge may not necessarily be aligned with disciplinary knowledge (e.g., scientifically valid evidence and explanations).

## Critical Analytic Thinking

An interdisciplinary group of educational, developmental, and social psychologists, cognitive neuroscientists, and educational researchers met in 2013 to wrestle and come to consilience with the notion of critical analytical thinking. In an introduction to an *Educational Psychology Review* special issue detailing the meeting outcomes, Alexander (2014) shared the group's agreed-upon claims and model of critical analytic thinking. In terms of shared claims, the group agreed that critical analytic thinking is effortful and fundamental to expertise development in a particular domain. The group also agreed that critical analytic thinking can be taught in traditional educational environments, such as schools, reflecting the US educational reform efforts of the early- and mid-2010s. For example, *A Framework for K-12 Science Education* (National Research Council, 2012) asserts that critical analytic thinking is essential to all scientific and engineering practices, e.g., investigating phenomena via observation, experimentation, and model development. Similarly, the *College, Career, and Civic Life (C3) Framework for Social Studies States Standards* said that "Understanding is achieved by the careful investigation of questions, data collection, reading, analysis, and synthesis; in effect, data are transformed into evidence-based claims that separate opinions and conjecture from justifiable understandings" (National Council for the Social Studies, 2013, p. 89). Both these social studies and science education frameworks stress that students should engage in these expert, critical analytical practices to develop civic and scientific literacy by the end of grade 12.

Thus, the development of expert levels of disciplinary knowledge requires use of critical analytical thinking. Byrnes and Dunbar (2014) posited that critical analytical thinking needs, at least some, domain-specific knowledge. Such knowledge includes both domain-specific metaconceptual knowledge—"stable and storable knowledge about [domain] concepts and the [domain-specific] factors influencing concept formation" (Yuruk et al., 2009, p. 453)—and metaprocedural knowledge—"general rules that can justify [domain-specific] procedures" for data collection and analysis (Hatano, 1990, p. 246). These ideas suggest that critical analytical thinking requires factual, conceptual, procedural, or metacognitive knowledge that is aligned and consistent with disciplinary knowledge (Lombardi et al., 2021). Recent educational reforms stress that learning within a particular domain should progress from more concrete to more abstract conceptual understanding, while simultaneously developing various critical analytic skills (e.g., constructing, critiquing, and writing arguments focused on discipline-specific content; National Governors Association, 2010). However, despite these systematic reform efforts, clear characterization and effective assimilation of these three human thinking forms—higher order, critical, and critical analytical—remains just at the horizon of educational research and practice.

## Overview of the Special Issue

Although the “information deluge” inundating all of society demands that students, teachers, and the general public think deeply, critically, and analytically, questions over the essential nature of these forms of human thought are by no means a new. Philosophers across centuries have wrestled with the question of what it means to think deeply, critically, and analytically and what do these forms of thought require of individuals, the learning context, and society. There are many theories and libraries of empirical research, educational standards and guidelines, and policy statements that refer to higher order, critical thinking, or critical analytic thinking. However, an examination of those writings reveals a lack of clear or consistent definitions or delineations as to what each term signifies about human thought.

Our concern over precision and explication of these core terms is more than a semantic exercise for theorists and researchers. It has direct and practical consequences for anyone invested in ensuring that members of society are educated and equipped to deal with the flood of information they must continuously confront—a flood that carries its share of confusing, misleading, distorted, and wholly false information. For example, Sinatra and Hofer (2021) said that “there has been a dire need” to critically evaluate online information during recent global virus outbreaks because “misinformation and disinformation can spread faster than the pandemic across online news and social media platforms” (p. 129). Kozyreva et al. (2022) similarly suggested that digital literacy and critical thinking should focus on “choosing what to ignore, learning how to resist low-quality and misleading but cognitively attractive information, and deciding where to invest one’s limited attentional capacities” (p. 2). In light of rampant denial and disinformation, Allchin (2022) lamented that that teaching higher order, critical, and critical analytical thinking “as an ad hoc nuts-and-bolts approach to informal logic, fallacies, and other cognitive lapses...is unattainable” (p. 4). Therefore, beyond the ability to discern the relevant from the irrelevant, the credible from the noncredible, or the plausible from the non-plausible, students, teachers, stakeholders, and societies benefit by making rational, logical, and reflective decisions centered on disciplinary knowledge, rather than acting irrationally, illogically, and impulsively based solely on prior experiences, belief, and motivated reasoning (Lombardi, 2022; Stanovich, 2016). Therefore, we (the co-editors and authors) approached this special issue with the following omnibus research question: Are “higher order,” “critical,” or “critical analytic” different modifiers for the same array of mental processes or are they meant to capture unique forms of cognition?

This special issue investigated this question in a manner that is not only theoretically and empirically of value, but which should also offer practical guidelines to those seeking to foster higher order, critical, or critical analytic thinking in others. Although many special issues may have the objective of bringing together scholars with contrasting viewpoints on well-established but controversial topics (e.g., social relationships and contexts in academic motivation; Wentzel & Skinner, 2022), while other special issues involve groups of researchers with complementary perspectives on some broad issue (e.g., an evolutionary perspective

on academic learning and schooling; Geary & Xu, 2022), our intention was different. We (the co-editors) gathered a group of scholars from varied domains of inquiry committed to exploring the constructs of higher order, critical, and critical analytic thinking—as described and assessed in their fields—with the understanding that there is ambiguity surrounding these constructs in general.

For this special issue, we (the co-editors and authors) chose four arenas of theory and research that regard human thinking in cross-disciplinary ways rather than within any one content domain such as mathematics or science. Specifically, we begin with the contribution of Murphy et al. (2023) that frames the conceptions of higher order, critical, and critical analytic thinking within classical and contemporary philosophy. These philosophical roots that Murphy et al. identified carried forward into the subsequent articles in the issue that delve into varied areas of educational psychological inquiry. For example, Dinsmore and Fryer (2023) challenged traditional Cartesian efforts to position strategies into discrete categories (Overton, 2014) and instead considered how the implementation of strategies when solving problems or monitoring and regulation learning provides essential clues to the relations of higher order, critical, and critical analytic thinking.

Another arena of research that is cross-domain and relies on the enactment of elevated human thinking is the multisource use literature, especially when the focus is on controversial topics and argumentation. List and Sun (2023) delved into the way in which higher order, critical, and critical analytic thinking are discussed or implied within the theories and studies that populate this field. Finally, Loyens et al. (2023) moved the theme of this special issue into the realm of pedagogical practice by exploring these three constructs as they manifest in student-centered instructional environments. These environments include problem-based and project-based learning approaches, which draw heavily on the Delphi Report (Facione, 1990) to document the instantiation of higher order, critical, and critical analytic thinking.

To create cohesion across the four articles, we asked each group of contributors to review the conceptualization and operationalization of higher order, critical, or critical analytic thinking in their respective literatures, and to identify any particular issues or concerns unique to that arena of inquiry. Related to the aforementioned points and given the diversity of scale these works represent (i.e., philosophical orientations, specific problem-solving tasks, learners' analysis and synthesis of multiple documents, and classroom-level interactions), contributors also addressed the grain size at which these focal constructs are measured, examined, and assessed. Contributors also offered guidance to researchers, educational practitioners, school leaders, as well as policymakers on achieving greater precision in their use of these three terms and on operationalizing the constructs of higher order, critical, or critical analytic thinking in their research designs, assessments, instructional interventions, or policies.

In the final article in this special issue, Alexander (2023) built on the findings from across the four chosen domains by first addressing the question of whether higher order, critical, and critical analytic thinking are, in fact, distinct areas of

“valued thinking.” She positions these three constructs based on the generality of the constructs, purposes for which they are to apply, and the presence or absence of any determinative criteria for identification of higher order, critical, and critical analytic. Alexander closes by setting out guidelines that researchers, educators, school leaders, and policymakers can use to navigate the realm of valued human thinking. These defining characteristics and relative positioning of higher order, critical, and critical analytic thinking, along with specific guideposts, have long been missing within educational and psychological research. Taken together, this special issue and the contributions it contains can serve all who wish to smoothly navigate the complexities of development, learning, and teaching via higher order, critical, and critical analytic thinking.

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