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COMMENTARY

"Here Be Dragons!" Mapping the Realm of Higher-Order, Critical, and Critical-Analytic Thinking

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Abstract
The goals of this article are three-pronged. The first is to consider the perspectives and insights collectively offered by the four contributions to this special issue dealing with higher-order, critical, and critical-analytic thinking. The second is to build on the content of those contributions and on the literature from philosophy and educational psychology to establish meaningful distinctions among higher-order, critical, and critical-analytic thinking. Those distinctions are then used to map the relative position of these three forms of mental engagement within the realm of "valued" thinking. Valued thinking is an omnibus label for reflective and intentional thinking prized over reactive or intuitive thinking. Third, this treatise sets forth cautions for those seeking to navigate the realm of valued thinking or to guide others toward that destination.

Keywords Higher-order thinking · Critical thinking · Critical-analytic thinking · Learning · Reasoning

As a young student, I was captivated by ancient maps that cartographers created to represent parts of the world that few had ever seen or ever hoped to see. No matter how primitive those depictions were, they were prized, especially by those with aspirations to navigate those treacherous waters. One feature of ancient seafaring maps that never failed to feed my curiosity or spark my imagination was a graphic warning to any mariners who might be foolhardy enough to venture forth into uncharted waters, *hic sunt dracones*. Here be dragons! The message was clear. Explorers of those unmapped waters were placing themselves and the success of their voyage in peril.

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In many ways, those ancient maps, with their warnings of lurking dangers, are a suitable metaphor for the exploration represented by this special issue. There is no question that the destination sought by those embarking on this venture represents an admirable end. A more precise and detailed mapping of higher-order, critical, and critical-analytic thinking, all lauded forms of human thought, is a prize worthy of pursuit. Moreover, all contributors to this special issue understood that there were no guarantees that they would achieve all they set out to accomplish. Over the centuries, many have sought to represent the topography of human thought and to map the boundary between its more or less valued manifestations. Yet, those prior chartings were incomplete and often confusing; leaving those who navigate the realm that has been variably named higher-order, critical, or critical-analytic thinking without the demarcations required to reach their desired destination. For the remainder of this treatise, I will commandeer the phrase *valued thinking* from Murphy et al. (this issue) as the über label for this sought-after destination.

So, what would compel the contributors to this special issue to undertake yet another mapping expedition? What benefits could possibly be reaped from this effort that has not already been realized? Perhaps all that one could hope for when exploring human thinking are vague renderings of the separation between less valued from more valued thinking. Perhaps, that is all that is required. On the contrary, I contend that there are good reasons to assume the risks that come with yet another mapping expedition into the realm of valued thinking. For one, as the contributors to this special issue chronicled, existing depictions in the literature, with few exceptions, are insufficient to guide research or instructional practice, with no definitive boundaries between *lower* and *higher* or *critical* and *uncritical* thinking.

It was not even evident from the literature surveyed in this special issue whether the areas designated as higher-order, critical, or critical-analytic are truly distinct regions at all, or simply the language preferred by those privileged enough to create those maps. Such vague renderings may prove sufficient for many whose educational or psychological research and instructional practices do not require them to venture deep into questions of valued thought. However, as the editors and contributors to this special issue, our theoretical and empirical work invariably draws us into questions about the nature of valued thinking and about conditions that foster or frustrate such thinking. Moreover, as theorists, researchers, and educators, we are often required to judge the depth or shallowness of the thinking we witness in ourselves and others. Thus, if we are to recognize, analyze, predict, or facilitate conditions that foster depth or richness in thinking, then crude indicators will not suffice.

There are other reasons why those contributing to this special issue have chosen to take up this challenge. Generally, as the theorists and researchers on this expedition, we collectively acknowledge that better representations of human thought in our domains of expertise have been elusive. Nonetheless, I appreciate that our perspectives on valued thinking also diverge in non-trivial ways. As individuals trained in different disciplines and as members of varied research communities, the orientations and traditions we bring to this examination will deviate to some extent. Rather than see such deviations as problematic, as editors and contributors, we regard this as a strength. We felt that through the process of triangulation we would be better

able to identify key features of valued thought and be able to recognize areas of convergence made more apparent by the places where our ideas diverged. That is precisely why the special issue editors proposed an assemblage of scholars who come to the question of valued thinking from different vantage points.

For instance, Murphy et al. (this issue) approach the question of what counts as valued thinking primarily from the perspective of philosophy. In so doing, these researchers offer provocative and significant insights into how that "value" has been set over the centuries by a privileged few and what can be done to liberate those determinations. Specifically, in this expansive and thought-provoking piece, the authors remind us of the significant contributions of classical philosophers—Socrates, Plato, and Aristotle—and modern-day pragmatists—James, Dewey, and Peirce. However, this treatise does not end there. To the contrary, these authors open our eyes to the way in which power and privilege have silenced certain voices that sought to bring alternative interpretations of what qualifies as valued thinking into the collective consciousness (Kozol, 1991). What also surfaces from those authors' exploration are clearer distinctions for higher-order, critical, and critical-analytic thinking that hinge largely on the role of justification and what constitutes quality evidence. Yet another thought-provoking theme in this article pertains to the legacy of behaviorism that has obstructed our view of valued thought. That legacy centers on the quantification of phenomena that are largely intangible, hidden deep in the recesses of the human mind.

What follows that more philosophical venture is an exploration of thinking critically that traverses the rich literature on strategic processing. By envisioning valued thinking from this position, Dinsmore and Fryer (this issue) unveil crucial forces that are often overlooked or misrepresented in theoretical and empirical writings on critical thinking and strategic processing. For one, these authors remind us that valued thinking is reliant on mental engagement that requires intentionality, effort, and monitoring on the part of the thinker. In essence, they argue that the attainment of critical thinking cannot be relegated to skills or routinized behaviors that occur automatically or rather mindlessly.

These scholars also acknowledge that there are attributes of individuals that influence whether the mental processes they evoke allow for deep, probing, and transformative thoughts to emerge. Those attributes include thinkers' relevant knowledge and experiences, inquisitiveness, comfort with uncertainty, and persistence in the face of challenges. While recognizing these important characteristics, Dinsmore and Fryer take great care to distinguish the process of thinking from the thinker per se. What their exploration also brings to the surface is an important distinction between the process of thinking and its product. Finally, what Dinsmore and Fryer make apparent is that many tools researchers use to record the processes and assess the products of valued thinking are sadly inadequate and may even misrepresent the phenomenon they seek to portray.

Within the third contribution, List and Sun (this issue) set a course for valued thinking by way of a particular and complex literacy task, learning from multiple texts. These authors justify this arena of investigation based on its pervasiveness and the complexity that should be fertile ground for exploring valued thinking. From their vantage point, the authors looked at this burgeoning literature in a manner not

previously considered. One key finding they unearthed was actually echoed in other articles in this special issue—the paucity of explicit language to identify the valued thinking that was expected from this undertaking. It would seem that researchers and practitioners may operate under the assumption that valued thinking must naturally arise when certain task conditions are in place; a rather risky assumption it would seem. List and Sun also describe the disjunction between the processing required during task performance and what is implicated in production after texts have been read, analyzed, and synthesized. The authors' review also raises the critical question of how students are to acquire the knowledge and processing abilities needed to engage multiple texts deeply and to create a product based on the analysis, synthesis, and integration of the content they contain.

Finally, the contribution to this special issue by Loyens et al. (this issue) transports the internal workings of the mind into the external world of the classroom. Through their systematic review of studies involving project-based or problem-based learning approaches, these authors set out to document how valued forms of thinking can be described, encouraged, supported, and evaluated within instructional programs. The initiators of these student-centered approaches (Barrows & Tamblyn, 1980; Dewey, 1938) sought to construct environments that would naturally engage learners in valued thinking around problems or projects of personal or societal importance. Key features that define these approaches include group work, opportunities to build requisite background knowledge, consensus building among group members on proposed and alternative solutions, and the sharing of findings. In general, the outcomes valued within these student-centered programs have been described as critical-thinking skills and dispositions. However, neither of these terms appears to have been well defined by researchers or even explicitly taught (Loyens et al., this issue). Two insights from this review seem especially important to the mapping of higher-order, critical, and critical-analytic thinking. The first is the discrepancy between what is programmatically assumed and what is actually manifested. The second is the place of dispositions within the realm of valued thinking—concerns that echo the findings of Dinsmore and Fryer (this issue). I will return to these issues in the final section of this article.

Positioning Higher-Order, Critical, and Critical-Analytic Thinking

The primary goal of this special issue was to investigate three terms that signify mental engagement prized over more reactive, intuitive, or pedestrian forms of human thought: higher-order, critical, and critical-analytic thinking. The hope was that this journey through less charted waters would lead to a more precise mapping of valued thinking that can aid others seeking to navigate this realm. In setting out on this expedition, I was not ignorant of the perils that others have faced. Decades ago, Larry Cuban, an educational prognosticator, warned: "Defining thinking skills, reasoning, critical thought and problem solving is troublesome to both social scientists and practitioners. Troublesome is a polite word; the area is a conceptual swamp" (1984, p. 676). Nonetheless, I have chosen to push forward into this conceptual (and methodological) morass, guided by the work and insights of the four

contributors to this special issue. To do otherwise would be to leave future travelers without any data garnered from this expedition.

One of the controversial questions that guided this special issue was whether there are truly meaningful distinctions to be drawn among the often-used terms for valued thinking—higher order, critical, and critical-analytic thinking—or not. I acknowledge that the labels, higher-order thinking and critical thinking, have a life that extends beyond contemporary theory and empirical inquiry. These terms have found their way into everyday parlance. In contrast, critical-analytic thinking is a more recent descriptor appearing less in the research literature or common discourse (Alexander, 2014). Popularity and recency aside, however, all three terms signify some manner of mental activity regarded as worthwhile and necessary for dealing with complex, non-routine problems, and they have been associated with enhanced or improved performance (Blumenfeld et al., 1991; Grossnickle Peterson et al., 2017; Murphy et al., 2018). This commonality aside, the answer that I would now forward to the question of whether there are meaningful differences in what these three terms signify about human thinking is "yes." In the ensuing section, I justify that response based on evidence proffered by the contents of this special issue and on characterizations those contributions engendered. I initially delve into each form of valued thinking separately and then draw meaningful comparisons among them in Table 1.

Higher-Order Thinking: Breadth Versus Depth

In my 40+ years of research, I have divined a particularly salient pattern when it comes to the conceptualization of social science constructs: *The more commonplace and widespread the use of a specific term, the less likely that term will be well and consistently conceptualized.* That seems to be the fate of the construct of higher-order thinking. Of the terms addressed in this special issue, "higher-order" is arguably the most commonly used label for human thought that departs from intuitive, impulsive, or non-contemplative mental functioning (Lewis & Smith, 1993). The very descriptor higher is meant to signify a boundary of sorts between this more prized manner of thinking and less valued forms. Nonetheless, as the use of the relative implies, there is no definitive line between which manifestations of human thinking can unequivocally be identified as "higher" or "lower."

Even the developers of the taxonomy for the cognitive domain, which remains the most cited source of evidence for the designation "higher-order" (Bloom et al., 1956), recognized that the problem of appropriate ordering had "probably not been solved completely satisfactorily" (p. 18). When Anderson et al. (2001) set out to improve upon Bloom et al.'s (1956) original taxonomy, they sought to expand and reconfigure the processes encompassed in the original, while retaining "the principle of increasing complexity" central to the taxonomy (Anderson, 1999, p. 8). Yet these renovators did not embrace the "cumulative hierarchical structure" (p. 8) that Bloom et al. had conveyed. They made that decision based, in part, on the manner in which the cognitive processes varied as a result of contextual and domain-specific factors—although the revised taxonomy remains heavily generic in form.

Table 1 Characterization and comparison of higher-order, critical, and critical-analytic thinking

Form	Principal sources	Philosophical/psychological orientations	Key features	Primary strengths	Major limitations	Practical implications	Empirical considerations
Higher order thinking	Bloom et al. (1956) Anderson (1999) Anderson et al. (2001) revision	Psychological perspective Cognitive/behavioral orientation Primarily assessment focused	Specific listings of cognitive outcomes Relative ordering of lower or higher mental processes Indicators treated as "skills"	Focus on cognitive targets meant to override rote of learning or non-reflective thinking Processing terms are broadly used and, thus, seemingly familiar Provides a useful template for item writing and curriculum development Ease of coding	The specific assessment terms are variably interpreted in research/practice The demarcation between higher order and lower order mental processes remains "fuzzy Quality of the performance of cognitive processes is not well considered	The presence of terms can give the illusion that valued thinking is occurring No consideration of how students are to acquire these mental abilities	The reference to higher order in research is often inconsistent with Bloom et al.'s intentions Researchers often fail to define higher order generally or the particular terms Quality data on processes often weak
Critical thinking	Dewey (1910) Facione (1990) Ennis (1989)	Philosophical/pragmatic orientation Heavily influenced by Dewey's reflective thinking Part of the Critical Thinking Movement	CT is seen as having a cognitive skill and dispositional dimension Dispositions akin to habits of mind Explicates skills and subskills in some detail	Used as a framework for problem- and project-based learning Greater emphasis placed on students' reflective thinking and engagement than in HOT	Using the language of "skills" and "subskills" undermines the pragmatic idea of habits Offers tentative guidance on how CT could be developed CT and quality evidence are treated generically	The quality of outcomes from problem- and project-based learning not consistently measured Not apparent how dispositions are to be assessed or changed	Consideration of differences in justification and quality evidence by problem and domain needed Better measures needed Labeling a person as a critical thinker is problematic

Table 1 (continued)

Form	Principal sources	Philosophical/psychological orientations	Key features	Primary strengths	Major limitations	Practical implications	Empirical considerations
Critical-analytic thinking	Dewey (1896, 1910) Peirce, (1898) Habermas (1993) Quine, (1969)	Philosophical & psychological orientations Pragmatism and analytical philosophy	Combines domain-general and domain-specific views of evidence Considers situational and sociocultural aspects of analysis and justification Places emphasis on the justification and evidentiary nature of reasoning	Evidence-based justifications are essential for CAT Focuses on developing students' epistemic competence Does not take for granted that items or tasks requiring HOT or CT result in either Sets aside dispositional component Disregards CAT as skill but rather as mindful, intentional processing	Requires more empirical evaluation Effective instructional models exist but they are limited Situated nature makes simplistic guidelines for judging quality of outcome impossible Nuances in what counts as quality can complicate assessment and teaching efforts	High demands on educators to understand complex problems in sociocontextual way Eliminates simple coding of outcome as right/wrong or higher/lower Runs counter to traditional structure of schools and learning Expands the notion of "valued" thinking beyond traditional canon	More training programs and interventions to develop CAT are required Tools for judging the relevance, suitability, and depth of evidence needed Longitudinal studies of effects of CAT across contexts important

Another reason why I have positioned "higher-order" to the periphery of the realm of valued thinking relates to the purpose for the generation of its taxonomic designation. Bloom and committee members, who were predominantly college examiners from leading American universities, devised the taxonomy for the purpose of providing guidance in the writing of educational objectives, the construction of assessments, and the development of curricular documents. Further, those purposes were cast in the language of behavioral objectives. That fact helps to explain why knowledge was positioned as it was in the taxonomy. Specifically, Bloom et al. conceived of knowledge as simple facts that could be memorized, regurgitated, and thus objectively assessed.

Conversely, "evaluation" was viewed as the most complex of the six cognitive behaviors. Yet Bloom and the committee were aware of the potential problems in this ordering. As they wrote:

For the most part, the evaluations customarily made by an individual are quick decisions not preceded by very careful consideration of the various aspects of the object, idea, or activity being judged. These might more properly be termed *opinions* rather than *judgments*. Customarily, opinions are made at less than a fully conscious level and the individual may not be fully aware of the clues or bases on which he is forming his appraisals. For purposes of classification, only those evaluations which are or can be made with distinct criteria in mind are considered. Such evaluations are highly conscious and ordinarily are based on a relatively adequate comprehension and analysis of the phenomena to be appraised. It is recognized that this may be far from the normal state of affairs. It is, however, based on a recognition that educational procedures are intended to develop the more desirable rather than the more customary types of behavior. (1956, p. 186) [my emphasis]

Regrettably, the need for students to provide substantiation for the decisions or judgments they reached was not a specific requirement of these *evaluations*. Without this specification, it is possible for "evaluations" to take the form of non-reflective opinions rather than reasoned judgments (Lombardi et al., 2016). This remains a continuing problem in the mapping of valued thinking as I will illustrate in the ensuing discussion of critical thinking.

Critical Thinking: Journeying Deeper into Valued Thought

Compared to higher order thinking à la Bloom et al. (1956), critical thinking, as characterized by those who identified with the Critical Thinking Movement of the 1980s, progressed deeper into the realm of valued thinking. As I will endeavor to show, critical thinking brings travelers closer to locating valued thinking over higher-order thinking, although serious limitations remain (see Table 1). As Bloom et al.'s taxonomy served as the gateway into higher-order thinking, "Critical Thinking: A Statement of Expert Consensus for Purposes of Educational Assessment and Instruction: Research Findings and Recommendations" (Facione, 1990) became a landmark document for critical thinking. Better known as the Delphi report, for the consensus building method the committee employed, this work was sponsored by the American Philosophical Association. Thus, philosophers were a dominant force

in the construction of the report, but they were joined by psychologists, educators, and assessment experts. Not only was there less of a behavioristic overtone in this report but also more consideration of messier, less structured societal issues alongside. This conceptualization of critical thinking also differed from higher-order thinking in the emphasis placed on *instructional approaches* rather than *instructional objectives*. This focus was quite evident in the review of project-based and problem-based programs by Loyens et al. (this issue).

Similar to Bloom et al. (1956), this consensus building resulted in a list of six cognitive processes that the committee (erroneously in my judgment) labeled skills or abilities (i.e., interpretation, analysis, evaluation, inference, explanation, and self-regulation) along with related subskills. Each skill was described in detail, as were the associated subskills. "Inference," for example, was said to encompass the ability…

to identify and secure elements needed to draw reasonable conclusions; to form conjectures and hypotheses; to consider relevant information and to educe the consequences flowing from data, statements, principles, evidence, judgments, beliefs, opinions, concepts, descriptions, questions, or other forms of representation. (Facione, 1990, p. 16)

Presented in similar detail, inferences subskills were querying evidence, conjecturing alternatives, and drawing conclusions. This particular example illustrates that the conceptualization of these six skills extends well beyond the typical meaning conveyed in the psychological and educational literature. For instance, in the text-processing literature, an inference can refer to the ability to extrapolate meaning that is not expressly stated but is implied within a text (McNamara, 2021). It would seem that conceptualizations of these cognitive activities within the Delphi report are more rooted in philosophy than psychology or education.

The same contention is true of the skill "explanation." In the Delphi report, the delineation of explanation is more elaborate than the commonplace notion of giving an accounting, detailing, or providing clarifying information. Explanation was described as the ability…

to state the results of one's reasoning; to justify that reasoning in terms of the evidential, conceptual, methodological, criteriological and contextual considerations upon which one's results were based; and to present one's reasoning in the form of cogent arguments. (Facione, 1990, p. 18)

This specificity and purposes ascribed to critical thinking by Facione and others move it closer to the ideal of valued thinking. Nonetheless, the non-trivial concerns swirling around this conceptualization and operationalization of critical thinking indicate there is still some distance to go before the epitome of valued thinking is reached. One area of concern pertains to efforts to delineate dispositions that mark one as a critical thinker. In effect, this literature not only centered on the *what* of critical thinking but also the *who*. This decision, in my judgment, took this venture off course.

Yet, the more significant limitation within the critical thinking literature remains the absence of any definitive boundary that indicates that this desired destination of valued thinking has been reached. In effect, there were so many suggested characteristics of critical thinking within the Delphi report (1990), but no clarity as to

which of the myriad of characteristics were held to be necessary and sufficient for the mental activity to attain the status of valued thinking. Does any one of the listed skills qualify the act as critical thinking? Or is it assumed that the ideal state of critical thinking requires the manifestation of all these skills and subskills? Indeed, the committee purposefully referred to the collection of skills and subskills as a "list" to avoid any sense of ordering or hierarchy. While that is all well and good from the standpoint of a theoretical discussion, it fails to establish the line between what ultimately qualifies as valued thinking and what does not.

Critical-Analytic Thinking and the Necessity of Evidence-Based Justifications

A decade ago, 18 multidisciplinary scholars gathered together to delve into questions about what it means to think critically and analytically and what is required to foster this form of valued thinking in children, youth, and adults. This gathering was sponsored by American Educational Research Association's Education Research Interdisciplinary Conferences Program (Alexander et al., 2013). As with the Delphi report, this conference aimed to seek common ground or consilience (Whewell, 1840; Wilson, 1998) among the attendees whose varied disciplines included educational policy and leadership, cognitive neuroscience, developmental psychology, language and literacy, social psychology, individual differences, measurement and assessment, and educational psychology. There was agreement among the participating scholars that the ideas about higher-order and critical thinking were vague and underspecified. Further, efforts to promote deep reflective thinking and decision-making that was evidence-based and adequately justified were often unsuccessful or their influence was limited. As Bailin et al. (1999b) so eloquently argued:

> As soon as [theorists] begin to spell out in more concrete terms what critical thinking consists in, what educational attainments are required if one is to be a critical thinker, and what means are likely to be efficacious in teaching persons to think critically, that is to say, as soon as they interpret the term in such a way as to provide a clear conception of critical thinking, agreement evaporates. (p. 285)

As an alternative to the more familiar terms of higher-order and critical thinking, the participants in the Interdisciplinary Conference chose to use the language of critical-analytic thinking for several reasons. For one, they wanted to avoid whatever preconceptions about higher-order or critical-thinking participants might bring to the discussions. There was also a growing philosophical and psychological literature that endowed critical-analytic thinking with a salient attribute that seemed absent from the existing literature, more determinative criteria for what does or does not qualify as valued thinking (Haack, 1993; Murphy, 2007; Quine, 1969; Wade et al., 1994). By wedding critical thinking and analytic reasoning, an individual or group can achieve "an examined understanding of something known or believed (see Table 1). This examination is characterized by a systematic evaluation of the object of thought and claims, reasons, and evidence forwarded about that object" (Murphy et al., 2014, p. 563). Moreover, the evidence and justification needed to support that evaluation must be well-matched to the nature of the problem at hand. Bailin et al. (1999b) made similar demands of those manifesting valued thinking:

For example, someone who comes to believe on the basis of poor or irrelevant reasons, on the authority of someone whose credibility is questionable, or without attempting to assess the evidence relevant to the truth of the belief, would not usually be regarded as thinking critically. This suggests that thinking about what to believe or do must meet appropriate standards if it is to be regarded as critical thinking. Moreover, these standards cannot be met merely by accident or happenstance. If someone were inadvertently to fulfil relevant standards in their thinking, but had not intentionally attempted to fulfil them, they would not generally be regarded as having engaged in critical thinking. To be engaged in critical thinking one must be aware that there are such standards and must be striving to fulfil them. (p. 287)

The evidentiary standards to which Bailin et al. (1999a, 1999b) refer must be understood in relation to the characteristics of the problem or issue to be analyzed, such as its complexity, as well as the sociocultural context or situation in which it is encountered. Alexander and colleagues called this *epistemic competence* (Alexander et al., 2011; Grossnickle Peterson et al., 2017). Specifically, epistemic competence can be defined as "the use of available contextual elements to determine the sources of evidence best suited for a given problem in an effort to provide an answer that is justified true belief" (Grossnickle Peterson et al., 2017, p. 257). Thus, those who apply the same evidentiary standards to varied problems would seem as misguided as those who offer no standards at all when justifying their views or judgments. Further, as Murphy et al. (this issue) strongly contend, establishing those standards cannot be the purview of a privileged few but must welcome the wisdom and experiences of all, most notably minoritized groups whose perspectives and histories have been overlooked for far too long. I could not agree more.

Perils on the Journey to Valued Thinking

With these distinctions among higher-order, critical, and critical-analytic thinking mapped out, I offer several warnings to others who wish to navigate the realm of valued thinking. Specifically, I want to warn individuals about the need to plot the conceptual course they are pursuing, push beyond reflection into deeper waters, look for signs of intentionality and effort, and stay focused on the journey.

Navigating Valued Thinking Demands Specification

I remember watching my late brother Robert, a navigator in the Air Force, chart and rechart his course before ever taking to the air. It was evident to him that being precise about one's destination and the path to follow was a critical first step in any journey. That is undoubtedly good advice for anyone who seeks to study valued thinking or to guide others to that port of call. Yet the articles in this special issue were a painful reminder that educational researchers and practitioners are far more likely to set off with little more than a vague sense of where they are going, what

is required to get there, and how to know if they have indeed arrived at the desired locale. For more than 30 years, my colleagues and I have been decrying the lack of clarity and specificity in the definitions of constructs that educational researchers and practitioners hold dear (Alexander et al., 1991; Alexander et al., 2009; Dinsmore et al., 2008; Murphy & Alexander, 2000). It would seem from this special issue that those cries have largely fallen on deaf ears.

Let me be clear, however, that I am not calling for a consensus definition of valued thinking. Those who have devoted themselves to such endeavor (Anderson et al., 2001; Bloom et al., 1956; Facione, 1990) can certainly attest to the herculean effort required to come even close to that goal. Rather, all I am asking is that researchers investigating some manner of valued thinking or those trying to educe valued thinking in others begin by being explicit and sufficiently detailed in what they hold those ideas to mean. They should also work toward means and measures that clearly and appropriately reflect the conceptions they forward. I do not regard these preparatory steps as too much to ask of researchers or practitioners.

Valued Thinking Requires More than Reflection

One point of consensus among the contributors to this volume, as well as most researchers who delve into valued thinking, is that John Dewey's (1910) writings on reflection are foundational. As with Dewey (1910) and James (1890), I regard reflection as necessary for any form of thinking that moves beyond ordinary, habituated, or reactive mental activity to arise. This demarcation between reflection and reaction parallels contemporary theory and research on Type 1 versus Type 2 (Stanovich & Toplak, 2012) or System 1 versus System 2 thinking (Kahneman, 2011). However, while passage into reflective thought leaves behind the more pedestrian, lower-order forms of human cogitation, there is still a great distance to progress before the ideal of valued thinking is reached. Moreover, while I recognize the reflection as the *sine qua non* of valued thinking, there are still hazards awaiting on the journey. For instance, those who have recently spent time in classrooms, either as teachers or as students, can likely attest to the fact that time for reflection is often in short supply (Hmelo-Silver, 2004). Teachers are taxed to cover the content (Schmidt et al., 2011), while students set their sights on getting their assigned tasks over and done as soon as possible (Alexander, 2018). Also, today's students who are members of the iGeneration often spend more time with their minds turned outward to the digital world than inward and engaged in thoughtful and mindful reflection (Rosen et al., 2013). This is certainly not the best formula for fostering valued thinking.

As discussed in this special issue, there are approaches like project-based or problem-based learning (Blumenfeld et al., 1991; Dahlgren & Dahlgren, 2002) and Quality Talk (Murphy et al., 2018) that emphasize reflection as part of a systematic instructional model. However, the successful implementation of these instructional models is predicated on more than reflection, as Lombardi (this issue) discusses in the overview of this special issue. Their developers recognized that valued thinking requires much more, such as a base of relevant knowledge about the topic or

problem at hand; strategies for gathering relevant information and for probing, analyzing, and synthesizing that information; and the opportunity to share their questions, hypotheses, and findings with others (Lombardi et al., 2013; Lombardi et al., 2021). Regrettably, it would seem that some researchers who claim to be using such student-centered approaches or programs have failed to demonstrate that these essential components have actually been implemented (Loyens et al., this issue).

Without Intentionality and Effort, Valued Thinking Cannot Be Realized

Within the educational psychology literature, there has been a concerted effort to alert researchers and practitioners to crucial distinctions between *skills* and *strategies* (Afflerbach et al., 2008; Alexander, 2006; Dinsmore, 2018; Harris et al., 2008). These distinctions, which include intentionality and effort, were well overviewed by Dinsmore and Fryer (this issue). Being among those who share this mission (Alexander et al., 1998), I was dismayed to find the repeated labeling of processes associated with higher-order or critical thinking as skills (Bloom et al., 1956; Facione, 1990). In essence, while I hold the notion of "habits of mind" (James, 1890) as core to my conceptualization of valued thinking, I would not equate habits of mind to habituated thinking. I appreciated Bailin et al.'s (1999a) reminder that the word "skill" has variable meanings within the philosophical, psychological, and educational literature. Nonetheless, for me and others, that term conveys a sense that the processes in question have been honed through repeated practice to the point of habituation or automaticity (Alexander, 2006; Bailin et al., 1999a; Dinsmore & Fryer, this issue).

Thus, the use of the word "skills" in the key writings on higher-order thinking and critical thinking strikes me as antithetical, even paradoxical, to what is required to reach valued thinking. As Resnick and National Research Council (1987) noted, the mental actions aligned with valued thinking are "nonalgorithmic, complex, effortful, and involve the application of multiple criteria, uncertainty (regarding the solution path to the problem), and self-regulation of the thinking process" (p. 44). This characterization is well beyond habituated thinking and acting. Essentially, one cannot operate on autopilot and be within the realm of valued thinking. The problem or task at hand must be thoughtfully analyzed and appropriate strategies must be intentionally chosen, their effectiveness monitored, and changes instituted as warranted. Bailin et al. (1999a) succinctly argued this point by stating that "all aspects of critical thinking centrally involve judgment, and judgment cannot be made routine" (p. 280). In effect, without intentionality and effort, valued thinking, as described by Murphy et al. (this issue), will remain elusive.

The Focus Should Be on Valued Thinking and Not on the Valued Thinker

Another label attached to critical thinking in the literature overviewed within this special issue was dispositions (Dinsmore & Fryer, this issue; Loyens et al., this issue). The subject of dispositions was most evident in the Delphi report (Facione, 1990). Although never explicitly defined in the report, the authors wrote of dispositions in their consensus statement:

The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant 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. Thus, educating good critical thinkers means working toward this ideal. It combines developing CT skills with nurturing those dispositions [which] consistently yield useful insights and [which] are the basis of a rational and democratic society. (1990, p. 3)

There was apparently controversy over the inclusion of dispositions in the final Delphi report. A substantial minority of the experts (30%) insisted that the term critical thinking be used "in a strict procedural sense, that is as referring only to a certain judgmental process. They [the dissenting 30%] distinguish sharply between what is true of critical thinking from what is true of good critical thinkers" (p. 22).

Indeed, I and others (Bailin et al., 1999b; Dinsmore & Fryer, this issue; Lombardi, this issue; Schutz et al., 2020) would have signed on to that minority report. To be clear, I acknowledge that individual differences or personality traits are influential in any human endeavor. You cannot subtract the person from the equation and still validly represent the phenomenon of valued thinking. Moreover, not only are people cognitively, socially, motivational, and emotionally unique, but also they function in social, historical, and cultural contexts that call for valued thinking. Thus, it is indefensible to assume that individuals, regardless of their positive dispositional characteristics, are willing and able to think critically and analytically in the manner and to the level required for the mental tasks they undertake.

My colleague, Paul Schutz, recently framed this conundrum provocatively when he wrote (personal communication, July 11, 2020):

Situationally, critical thinking is about a *particular problem* within a *particular social historical context*…Which begs the question, can someone who has been labeled a "critical thinker" not actually think critically in certain situations? If so, can they still be a "critical thinker"? *Can someone possess critical thinking?* [my emphasis]

Bailin et al. (1999a) forwarded a similar argument about the misleading connotation of "critical thinker" as a rather stable characterization:

To a considerable extent, the quality of thinking persons are able to do about a particular problem, issue or question is determined by what they know, or are able to find out, about it and about the context in which it must be resolved. Moreover, critical thinking always takes place in the context of (and against the backdrop of) already existing concepts, beliefs, values, and ways of acting. This context plays a very significant role in determining what will count as sensible or reasonable application of standards and principles of good thinking. Thus, the depth of knowledge, understanding and experience persons have in a particular area of study or practice is a significant determinant of the degree to which they are capable of thinking critically in that area. (p. 290)

I would add one more provocation to this cautionary tale of operating from the perspective of critical thinker versus critical thinking. Reasoning antinomously, for a moment, let us assume that it is possible to categorize individuals as critical thinkers or, in Facione's (1990) words, to identify those who habitually manifest the characteristics of the ideal critical thinker. We must consequently hold to the belief that we

can likewise identify those who are not critical thinkers; that is, those who habitually fail to display any of the characteristics ascribed to valued thinking. From my perspective, such a sorting task is an impossibility, given that anyone can manifest valued thinking if presented with a suitable problem in a supportive environment for which she or he has the requisite knowledge and the positive motivations to engage.

Valued Thinking is Always Subject to Changing Conditions

Within the world we inhabit, change is a constant. Although we, as Earth's tenants, may perceive relative constancy in the environmental spaces we routinely occupy, reality belies that perception. Everything is touched by the forces of nature or by manmade influences that result in imperceptible to dramatic transformations. The same can be said for the realm of valued thinking that the contributors to this special issue and I have been attempting to map. The contours of valued thinking are invariably in flux, whether that fluctuation can be observed or measured or not. It may take years, decades, or millennia to see the effects of those forces and influences on what is mapped as valued thinking, or such transformations may happen quite quickly depending on the nature and magnitude of cataclysmic events.

Still, as someone who believes deeply in the recurring patterns found in all nature, including human nature, I feel that it is a worthwhile enterprise to try and capture the topography of valued thinking at a time or over time. Only by chronicling the forces shaping the landscape and by charting the movements and changes we witness can we hope to represent the realm of valued thinking validly. Moreover, as stated at the outset of this venture, mappings of higher-order, critical, and critical-analytic thinking, the areas that comprise the realm of valued thinking, are indispensable for those who seek to embark on further explorations or who hope to guide the learning and development of others. Of course, it is impossible to know whether the surveys and records contained within this special issue will ultimately aid in those undertakings. What I can claim with confidence is that those who set forth to investigate valued thinking or to guide others toward that destination, but who are ill-equipped or ill-informed, put themselves on a perilous course. For such individuals, I say, *hic sunt dracones*. "Here be dragons."

References

Afflerbach, P., Pearson, P. D., & Paris, S. G. (2008). Clarifying differences between reading skills and reading strategies. *The Reading Teacher, 61*(5), 364–373. https://doi.org/10.1598/RT.61.5.1

Alexander, P. A. (2006). *Psychology in learning and instruction*. Pearson.

Alexander, P. A. (2014). Thinking critically and analytically about critical-analytic thinking. *Educational Psychology Review, 26*, 469–476. https://doi.org/10.1007/s10648-014-9283-1

Alexander, P. A. (2018). Information management versus knowledge building: Implications for learning and assessment in higher education. In O. Zlatkin-Troitschanskaia, M. Toepper, H. A. Pant, C. Lautenbach, & C. Kuhn (Eds.), *Assessment of learning outcomes in higher education: Cross national comparisons and perspectives (pp. 43-56)*. Springer.

Alexander, P. A., Dinsmore, D. L., Fox, E., Grossnickle, E. M., Loughlin, S. M., Maggioni, L., Parkinson, M. M., & Winters, F. I. (2011). Higher-order thinking and knowledge: Domain-general and domain-specific trends and future directions. In G. Schraw & D. Robinson (Eds.), *Assessment of higher-order thinking skills* (pp. 47–88). Information Age Publishers.

Alexander, P. A., Graham, S., & Harris, K. (1998). A perspective on strategy research: Progress and prospects. *Educational Psychology Review, 10*, 129–154. https://doi.org/10.1023/A:1022185502996

Alexander, P. A., Schallert, D. L., & Hare, V. C. (1991). Coming to terms: How researchers in learning and literacy talk about knowledge. *Review of Educational Research, 61*(3), 315–343. https://doi.org/10.3102/00346543061003315

Alexander, P. A., Schallert, D. L., & Reynolds, R. E. (2009). What is learning anyway? A topographical perspective considered. *Educational Psychologist., 44*(3), 209–214. https://doi.org/10.1080/00461520903029006

Alexander, P. A. Wentzel, K. R., & Dunbar, K. N. (2013). *Seeking common ground: A multidisciplinary examination of critical-analytic thinking in learning and development*. American Educational Research Association Research Conference.

Anderson, L. W. (1999). *Rethinking Bloom's taxonomy: Implications for testing and assessmen*t, ERIC No. ED435630.

Anderson, L. W., Krathwohl, D. R., et al. (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. Longman.

Bailin, S., Case, R., Coombs, J. R., & Daniels, L. B. (1999a). Common misconceptions of critical thinking. *Journal of Curriculum Studies, 31*(3), 269–283. https://doi.org/10.1080/002202799183124

Bailin, S., Case, R., Coombs, J. R., & Daniels, L. B. (1999b). Conceptualizing critical thinking. *Journal of Curriculum Studies, 31*(3), 285–302. https://doi.org/10.1080/002202799183133

Barrows, H. S., & Tamblyn, R. M. (1980). *Problem-based learning: An approach to medical education* (Vol. 1). Springer Publishing Company.

Bloom, B. S., Engelhart, M. D., Furst, E. J., Hill, W. H., & Krathwohl, D. R. (1956). *Handbook I: Cognitive domain*. David McKay.

Blumenfeld, P. C., Soloway, E., Marx, R. W., Krajcik, J. S., Guzdial, M., & Palincsar, A. (1991). Motivating project-based learning: Sustaining the doing, supporting the learning. *Educational Psychologist, 26*(3-4), 369–398. https://doi.org/10.1080/00461520.1991.9653139

Cuban, L. (1984). Policy and research dilemmas in the teaching of reasoning: Unplanned designs. *Review of Educational Research, 54*(4), 655–681. https://doi.org/10.3102/00346543054004655

Dahlgren, M. A., & Dahlgren, L. O. (2002). Portraits of PBL: Students' experiences of the characteristics of problem-based learning in physiotherapy, computer engineering and psychology. *Instructional Science, 30*, 111–127. https://doi.org/10.1023/A:1014819418051

Dewey, J. (1896). The reflex arc concept in psychology. *Psychological Review, 3*(4), 357–370. https://doi.org/10.1037/h0070405

Dewey, J. (1910). *How we think*. D. C. Heath & Co Publishers. https://doi.org/10.1037/10903-000

Dewey, J. (1938). *Experience and education*. Touchstone. https://doi.org/10.1080/00131728609335764

Dinsmore, D. L. (2018). *Strategic processing in education*. Routledge.

Dinsmore, D. L., Alexander, P. A., & Loughlin, S. M. (2008). Focusing the conceptual lens on metacognition, self-regulation, and self-regulated learning. *Educational Psychology Review, 20*, 391–409. https://doi.org/10.1007/s10648-008-9083-6

Dinsmore, D. L., & Fryer, L. K. (this issue). Critical thinking and its relation to strategic processing. *Educational Psychology Review*. https://doi.org/10.1007/s10648-023-09755-z

Ennis, R. H. (1989). Critical thinking and subject specificity: Clarification and needed research. *Educational Researcher, 18*(3), 4–10. https://doi.org/10.3102/0013189X018003004

Facione, P. A. (1990). *Critical thinking: A statement of expert consensus for purposes of educational assessment and instruction.* Research findings and recommendations. American Philosophical Association. (ERIC Document Reproduction Service No. ED315423)

Grossnickle Peterson, E. M., Alexander, P. A., & List, A. (2017). The argument for epistemic competence. In A. Anschütz, H. Gruber, & B. Moschner (Eds.), *Knowledge and learning in the perspective of learners and instructors: How epistemic beliefs affect school, university and the workplace* (pp. 254–270). Waxmann-Verlag.

Haack, S. (1993). Epistemological reflections of an old feminist. *Reason Papers, 18*, 31–43 https://reasonpapers.com/pdf/18/rp_18_3.pdf

Habermas, J. (1993). *Justification and application: Remarks on discourse ethics*. C. Cronin (trans.). Polity Press.

Harris, K. R., Alexander, P. A., & Graham, S. (2008). Michael Pressley's contributions to the history and future of strategies research. *Educational Psychologist, 43*(2), 86–96. https://doi.org/10.1080/00461520801942300

Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do students learn? *Educational Psychology Review, 16*(3), 235–266. https://doi.org/10.1023/B:EDPR.0000034022.16470.f3
James, W. (1890). *The principles of psychology*. Henry Holt and Co. https://doi.org/10.1037/10538-000
Kahneman, D. (2011). *Thinking, fast and slow*. Macmillan.
Kozol, J. (1991). *Savage inequalities*. Crown Publishing.
Lewis, A., & Smith, D. (1993). Defining higher order thinking. *Theory into Practice, 32*(3), 131–137. https://doi.org/10.1080/00405849309543588
List, A., & Sun, Y. (this issue). To clarity and beyond: Situating higher-order, critical, and critical-analytic thinking in the literature on learning from multiple texts. *Educational Psychology Review*. https://doi.org/10.1007/s10648-023-09756-y
Lombardi, D. (this issue). On the horizon: The promise and power of higher-order, critical, and critical-analytical thinking. *Educational Psychology Review.* https://doi.org/10.1007/s10648-023-09763-z
Lombardi, D., Nussbaum, E. M., & Sinatra, G. M. (2016). Plausibility judgments in conceptual change and epistemic cognition. *Educational Psychologist, 51*(1), 35–56. https://doi.org/10.1080/00461520.2015.1113134
Lombardi, D., Shipley, T. F., Team, A., Team, B., Team, C., Team, E., Team, G., Team, G., & Team, P. (2021). The curious construct of active learning. *Psychological Science in the Public Interest, 22*(1), 8–43. https://doi.org/10.1177/1529100620973974
Lombardi, D., Sinatra, G. M., & Nussbaum, E. M. (2013). Plausibility reappraisals and shifts in middle school students' climate change conceptions. *Learning and Instruction, 27*, 50–62. https://doi.org/10.1016/j.learninstruc.2013.03.001
Loyens, S. M. M., van Meerten, J. E., Schaap, L., & Wijnia, L. (this issue). Situating higher-order, critical, and critical-analytic thinking in problem- and project-based learning environments: A systematic review. *Educational Psychology Review*. https://doi.org/10.1007/s10648-023-09757-x
McNamara, D. S. (2021). If integration is the keystone of comprehension: Inferencing is the key. *Discourse Processes, 58*(1), 86–91. https://doi.org/10.1080/0163853X.2020.1788323
Murphy, P. K. (2007). The eye of the beholder: The interplay of social and cognitive components in change. *Educational Psychologist, 42*(1), 41–53. https://doi.org/10.1080/00461520709336917
Murphy, P. K., & Alexander, P. A. (2000). A motivated exploration at motivation terminology. *Contemporary Educational Psychology, 25*(1), 3–53. https://doi.org/10.1006/ceps.1999.1019
Murphy, P. K., Greene, J. A., Allen, E., Baszczewski, S., Swearingen, A., Wei, L., & Butler, A. M. (2018). Fostering high school students' conceptual understanding and argumentation performance in science through Quality Talk discussions. *Science Education, 102*(6), 1239–1264. https://doi.org/10.1002/sce.21471
Murphy, P. K., Ogata, T. M., & Schoute, E. C. (this issue). "Valued" thinking in education: Liberating the narrative. *Educational Psychology Review*. https://doi.org/10.1007/s10648-023-09754-0
Murphy, P. K., Rowe, M. L., Ramani, G., & Silverman, R. (2014). Promoting critical-analytic thinking in children and adolescents at home and in school. *Educational Psychology Review, 26*(4), 561–578. https://doi.org/10.1007/s10648-014-9281-3
Peirce, C. S. (1898). *Reasoning and the logic of things: The Cambridge conferences lectures of 1898*. Harvard University Press.
Quine, W. V. O. (1969). *Ontological relativity and other essays*. Columbia University Press.
Resnick, L. B., & National Research Council. (1987). *Education and learning to think*. The National Academies Press. https://doi.org/10.17226/1032
Rosen, L. D., Whaling, K., Rab, S., Carrier, L. M., & Cheever, N. A. (2013). Is Facebook creating "iDisorders"? The link between clinical symptoms of psychiatric disorders and technology use, attitudes and anxiety. *Computers in Human Behavior, 29*(3), 1243–1254. https://doi.org/10.1016/j.chb.2012.11.012
Schmidt, W. H., Houang, R., & Cogan, L. S. (2011). Preparing future math teachers. *Science, 332*(603), 1266–1267. https://doi.org/10.1126/science.119385
Schutz, P. A., Hong, J., & Francis, D. C. (2020). *Teachers' goals, beliefs, emotions, and identity development: Investigating complexities in the profession*. Routledge. https://doi.org/10.4324/9780429456008
Stanovich, K. E., & Toplak, M. E. (2012). Defining features versus incidental correlates of type 1 and type 2 processing. *Mind & Society, 11*(1), 3–13. https://doi.org/10.1007/s11299-011-0093-6
Wade, S. E., Thompson, A., & Watkins, W. (1994). The role of belief systems in authors' and readers' construction of text. In R. Garner & P. A. Alexander (Eds.), *Beliefs about text and instruction with text (pp. 265-294)*. Lawrence Erlbaum Associates.

Whewell, W. (1840). *The philosophy of inductive sciences*. Parker.
Wilson, E. O. (1998). *Consilience: The unity of knowledge*. Knopf.