Critical thinking process through the lens of paradigms and disciplines: A critical review

Nasim Gheshlaghi Azar
Ph.D candidate of Medical education, Virtual School of Medical Education and Management, Shahid Beheshti University of Medical Sciences, Tehran, Iran
Email: Nasim.Gheshlaghi.Azar@gmail.com
https://orcid.org/ 0000-0002-7727-5057

Shahram Yazdani
Associate professor of Medical education, Virtual School of Medical Education and Management, Shahid Beheshti University of Medical Sciences, Tehran, Iran
Corresponding author email: Shahram.yazdani@yahoo.com
https://orcid.org/0000-0002-9193-7557

Zohreh Khoshgoftar
Assistant professor of Medical education, Virtual School of Medical Education and Management, Shahid Beheshti University of Medical Sciences, Tehran, Iran
Email: bkhoshgoftar7@gmail.com
https://orcid.org/0000-0002-8178-2619

Abstract---Critical thinking (CT) has been recognized as an important student learning outcome in medical education. Given multiple conceptualizations of CT in the literature, this study aimed to clarify the theoretical foundations of this multiplicity. Also, the incorporation of the multiple conceptions in the CT process was investigated. In this way, we conducted a critical review of published literature to explore the theoretical origin of various perceptions of CT, and its incorporation in the CT process. Based on the results of this study, different understandings of CT can be viewed through the lens of paradigmatic and disciplinary perspectives. In view of this variability, the CT process is not solely based on thinking skills, but also the key role of the context in which the CT takes place, one's own creativity, reflection on her/his thinking process, socially construction of meaning, attitudes and dispositions toward CT, caring to others, and seeking problems through challenging the systems, should be taken into consideration.

Keywords---Critical thinking, Medical education, Process, Skill, Disposition.

Introduction

Educational scholars have long been aware of the importance of critical thinking(CT) as an educational ideal (Siegel 1980) (Hitchcock 2018). In the field of medical education, fostering students' CT is regarded as a key learning outcome, as well (Chan 2013; Kahlke and Eva 2018; Jafari et al. 2020; Soltani et al. 2021). Despite the consensus on the importance of CT as an important educational objective, multiple definitions of CT has been emanated, emerged from different theoretical school of thoughts (Brookfield 2013). Moreover, there are different interpretations of CT concept, depending on the discipline and context in which it occurs (Ennis 2015). This multiplicity of understanding of CT, reveals the difficulty of the task facing medical educators who intend to teach CT (Surkes 2009).

From the point of view of educational scholars, guiding the thinking path of learners through a process seems to be effective in CT development (Halpern 2013). The conventional view of CT process as a fixed and inflexible procedure which is based on checklist, has been criticized by some of the scholars, who consider such a mechanical process incapable of responding to multidimensional complicated problems, that CT is essentially used to respond to such complex issues (Paul et al. 1997; Hitchcock 2018). In fact, it seems necessary to incorporate multiple conceptions of CT in its process, in order to provide conceptual richness, strong thinking, and productivity (Kahlke and White 2013; Kahlke and Eva 2018).

Paying attention to the theoretical origin of different interpretations of CT, incorporating in the CT process, opens up understanding the concept of CT from different point of views, which in turn clarifies the issues latent in the multiple conceptualization. This could partly address the task difficulty that educators are faced during guiding the learners through the process of CT.

Based on the best knowledge of the authors, there are sparse evidence regarding the theoretical origin behind the multiple conceptualization of CT, incorporated in CT process, and the extent to which they are represented in the literature. To fill this gap, we conducted a critical review that primarily aimed to study the CT conceptualization in the literature. Then we scrutinized incorporation of multiple conceptions of CT in its process, with respect to their theoretical origin, in order to achieve a comprehensive framework of CT process involving different conceptualization of CT.

Method

This was a critical review of published literature to explore the theoretical origin of multiple conceptions of CT, and its incorporation in the CT process. Critical review is one of the most important methods of studies aimed at critically evaluating outstanding texts in the field of study, synthesizing the current status of knowledge in the field of research, and identifying knowledge gaps in that relationship. Typically, the final product of a critical review is a hypothesis or a conceptual model that is the result of the synthesis of existing models and/or schools of thought, or a whole new interpretation of existing data. In this way, the

model derived from a comprehensive critical review can be a starting point for future studies and opening up new perspectives on the subject under consideration (Carnwell and Daly 2001). Accordingly, due to ambiguities, knowledge gaps and scattered evidences regarding the theoretical origin of the multiple elements of CT process, we focused on different conceptualizations of CT, and the extent to which they are mentioned in CT processes. This study was performed based on CarnWell-Daly (Carnwell and Daly 2001) critical review method under the following steps:

1: Determining the scope of critical review: The scope of the search was restricted to English and Persian-language peer-reviewed journal articles, books and dissertations focusing on CT processes, and different points of views regarding CT concept.

2: Determining related resources through extensive search in the databases, considering inclusive and exclusive criteria: The electronic search was conducted on PSYCHINFO, MEDLINE, EMBASE, SID, and GOOGLE SCHOLAR for literature that was published between 1910 (the year of the publication of "How we think" by John Dewey) through to September 2022. The search terms included critical thinking, skill, disposition, process, which were extracted from key studies known to the authors in the field of CT. All search terms were limited to Title/Abstract. The articles resulting from this search ($n = 784$) were hand-searched by one author (NG) by reading the abstracts who removed papers that were not relevant or valid based on JBI checklist for texts and opinions. Full-text versions of the remaining identified articles ($n = 157$) were subsequently obtained where possible for a more detailed assessment. The electronic search was supplemented with a manual search of the reference lists from identified relevant studies and/or review articles, which finally resulted in 33 studies to be reviewed for this study. Articles were screened for eligibility independently by two investigator (NG, ZK).

3: Reviewing selected texts in order to achieve a generality of the literature in the field of study, the knowledge gaps in it and identifying the themes in the texts. In this stage, after full text reviewing of the extracted texts, the current state of knowledge in the field, as well as the major themes were identified.

4: Organizing critical reviews based on the main themes presented in the texts. The overall structure of the main body of critical review was organized based on the following major thematic subjects:
   - Conceptualizations of CT
     .Critical thinking from the perspective of paradigms
     .Critical thinking from the perspective of disciplines
   - Incorporation of multiple conceptualization of CT in its process

Results and Discussion

Based on the results of this critical review, different perceptions of CT can be classified into two general groups:

- *CT from the perspective of paradigms*
CT conceptualization has been dramatically evolved through paradigmatic transitions during the twentieth century. CT understanding as a set of skills, techniques and logical procedures, which has been referred to Technical or

Instrumental approach (Kahlke and White 2013), is mainly influenced from the positivistic tradition. In Technical approach to CT, in which analytical, abstract, and objective reasoning processes are focused, CT process comes with concrete objective steps that mainly include cognitive skills. Based on this approach to CT, critical thinkers are encouraged to avoid mental subjectivism, intuition, and creativity, in order to achieve justice and fairness (Walters 1994). In this line, little attention is paid to one's dispositions, attitudes and habits, and if there is talk of the individual's attitudinal dispositions, it is mainly "knowledge and attitude toward the application of logical argumentative skills" as it is mentioned by Glaser(Glaser 1941) . Furthermore, Technical approach advances the process of CT regardless of the context, in which thinking takes hold. Accordingly, thinking process can be generalized among disciplines and contexts (Thayer-Bacon 2000). Embraced the humanist constructivist assertion that CT is a highly contextual and creative process (McLAREN 1994), raised other dimensions in the discourse of CT. Scholars who believe in humanistic constructivist conceptualization of CT, criticize the technical approach, due to reduction of CT to a set of skills and procedures. Humanistic understanding of CT, which" reasserts the role of human unique-ness, self-exploration, and social interaction, seeks to replace claims to objectivity with subjectivity, abstraction with contextualization and positivistic notions of Truth with socially constructed truths (Kahlke and White 2013). The claim of subjectivity that stresses the active participation of the individual in thinking process, with her/his presuppositions, highlights the role of individual's imagination, creativity, and empathy in the CT process. Also, regarding CT as a context-dependent process, it cannot be separated from the social processes, within which it takes place. Accordingly, the image of an isolated critical thinker who seeks to achieve a single objective truth, is replaced with the co-created socially constructed subjective truths (Thayer-Bacon 2000) (Walters 1994; Kahlke and White 2013).

On the other hand, influenced by critical pedagogy and critical theory, some of the scholars argue that the assumptions governing schools of thoughts and the social systems should be challenged through CT to unveil the hierarchies and injustice, which paves the way for shifting paradigms (Gambrill 2006). (Freire 2021).

- *CT from the perspective of disciplines*
The literature on CT has roots in "Philosophical" & "Cognitive psychological" approaches to define CT that reflect their respective concerns (Lewis and Smith 1993). Philosophers of the early decades of twentieth century, influenced by the analytical philosophy, emphasize on the realization of CT in the form of using logical reasoning skills such as inductive and deductive reasoning, analyzing propositions and evaluating their accuracy, and discerning fallacies (Lai 2011). Such a logical and skill-oriented approach to CT is evident in the opinions of philosophers such as Glaser (Glaser 1941), who emphasizes the role of logic and reasoning, and their related skills in the conception of CT, Ennis (Ennis 1962), who considers CT to be "evaluating the accuracy of propositions", and Siegel (Siegel 1985), who suggests "reasoned perception" of CT. This point of view to philosophical understanding of CT has gradually evolved and other dimensions raise. Philosophers of the second half of the 20th century, inspired by their ancient predecessors, define CT as perfection of thought, relying on standards

and criteria (Ennis 1996; Paul et al. 1997; Lipman 2003). In this line, the philosophical approach to CT mainly focuses on the ideal characteristics of a critical thinker, i.e dispositions, habits of mind, and attitudes that contribute to being a strong critical thinker (Paul et al. 1997), which lead her/him to do under the best circumstances. This emphasis on the ideal critical thinker's features is evident in the published conceptions of Ennis (Ennis 1996), Facione (Facione PA 1995), Paul (Paul et al. 1997) and Lipman (Lipman 2003) that have in common the following dispositional and attitudinal characteristics of a critical thinker: Open-minded, fair-minded, searching for evidence, trying to be well-informed, attentive to others' views and their reasons, proportioning belief to the evidence, willing to consider alternatives and revise beliefs (Lai 2011). Paul (Paul et al. 1997) has also noted Intellectual traits which include humility, courage, integrity, perseverance, empathy, autonomy, confidence in reasoning. Furthermore, Ennis (Ennis 2015) does not consider one's own subjectivity and creative thinking apart from CT, while emphasizing paying attention to the value and dignity of all people. He also highlights the role of "Situation" in the CT process, abbreviated as "FRISCO"*. In this line, Lipman (Lipman 2003), in his three-dimensional model of thinking, highlights the interconnected relationships of creative and caring thinking with CT. Moreover, in agreement with Ennis, Lipman considers CT to be context-based.

The cognitive psychology approach to CT, by criticizing the philosophers' perfectionist point of view to CT, as an idealistic and out of real reach approach, tends to focus on how people actually think versus how they could or should think under ideal conditions (Sternberg 1986). Cognitive psychologists believe that CT is defined in the term of CT skills performed by a critical thinker in real circumstances with its limitations (Lewis and Smith 1993). Based on the cognitive psychologists' point of view, commonly cited cognitive thinking skills, mainly derived from the Bloom taxonomy, are as following: questioning and answering for clarification, defining terms, interpreting and explaining, analyzing arguments, claims, or evidence, making inferences using inductive or deductive reasoning, , seeing both sides of an issue, Judging or evaluating, making decisions or solving problems (Lai 2011).

Emerged from the cognitive psychological approach to CT, Sternberg (Sternberg 1986) defines CT as: "The mental processes, strategies, and representations people use to solve problems, make decisions, and learn new concepts". In this regard, Sternberg presents the skill-oriented model of CT including meta-components, performance components, and knowledge acquisition components.
Based on her skill-approach to CT, Halpern defines CT as: "The use of those cognitive skills or strategies that increase the probability of a desirable outcome"(Halpern 1998). However, in her later conceptualizations of CT, Halpern stresses the importance of one's attitudinal dispositions in the CT process in a simple equation as follows:

Attitude + Knowledge + Thinking Skills = Critical Thinking

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* F:Focus on the problem R:Reason I:Inferences S:Situation C:Clarity O:Overview

From Halpern's point of view, the attitudinal dispositions of CT (such as willingness to plan, willingness to accept own errors and change the mindset, flexibility, perseverance, mindfulness, seeking for an agreement) have the same credibility and value as CT skills. Inspired from the humanistic approach to CT, Halpern considers the role of emotions in the process of human thinking and decision-making, not accounting thinking as merely a logical process (Halpern 2013).

Discussion

This critical review scrutinizes multiple CT conceptualizations, incorporating in the CT process, based on their theoretical foundations. According to the results of this study, the governing discourse of CT is through the lens of the paradigmatic and disciplinary perspectives. However, it seems that the paradigmatic evolution has cast a shadow over the disciplinary understandings of CT. In the era of the dominancy of positivistic paradigm, CT is mainly conceptualized in a set of technical skills including analytical, reasoning, argumentative and deductive skills. Based on this school of thought, individuals' attitudes and mental habits are not paid much attention, in order to achieve objectivity, justice and fairness. Philosophers of this era emphasize on the realization of CT in the form of using logical reasoning skills. In a similar approach, cognitive psychologists also highlight the role of skills in the CT process. Such a technical and logical approach to CT has been seriously criticized by some of the scholars as a totalitarian approach, which underestimates the key role of human's subjectivity, as well as context, in understanding of CT(Walters 1994; Thayer-Bacon 2000). From the point of view of these scholars, the importance of logical reasoning and cognitive skills in the CT process is not undervalued, however, it is not the only way to realize the CT. In addition, the logical and technical approach to CT is considered as a logo of Western and masculine mode of thinking that does not include feminine non-analytical, imaginative, caring, and empathetic mode of thinking (Noddings 2013; Hayman 2019). Gradually, through the development of the paradigms of humanism, constructivism, feminism and postmodernism, other dimensions arise in the discourse of CT(Kahlke and White 2013). In this regard, cognitive aspects such as creativity, intuition, insight (Thayer-Bacon 2000; Lipman 2003), as well as one's attitudes and dispositions toward CT(Ennis 1996; Paul et al. 1997; Lipman 2003) are mentioned in CT conceptualizations. Furthermore, conscious participation of individual in social construction of meaning through interactions, dialogue, and discussion are taken into account (Prime 1998). Moreover, different contexts, along with the cultural and value systems embedded in those contexts, are taken into consideration, in perception of CT (McLAREN 1994; Walters 1994; Kahlke and White 2013). Emerged from the critical theory and pedagogy, the ultimate goal of CT is to challenge the traditional beliefs, as well as governing systems, in order to achieve social justice and freedom. In this way, critical thinker intends to seek problems in the current systems (Gambrill 2006). It is also noteworthy that although CT is inherently result-oriented, however; it is probable that the CT process does not achieve a specific answer, depending on the nature and complexity of the problem, contextual limitations, and disagreement of individuals. In such circumstances that numerous responses to the problem are raised, further studies and more comprehensive environmental surveys are recommended(Prime 1998).

In consideration of this conceptual richness regarding CT, the views to the critical thinker changes from a rational, indifferent person to an individual who inquisitively challenges the system and seeks the problems, has a serious commitment to tolerate pluralism, non-agreements and opposing opinions (rather than eliminating them), intends to social construction of meaning, reflects on own or other's point of views, and considers contextual variabilities.

Now the question arises that how has this richness of conceptions been seen in the process of CT? Based on the results of this study, it seems that since the introduction of the first CT process by Dewey in 1910, (Dewey 1997), the dominance of the skill-based or technical approach is evident in many processes. In some of the CT processes, derived from Bloom cognitive taxonomy, the cognitive and metacognitive skills such as explanation, analysis, inference, interpretation, evaluation, and self-regulation are emphasized. In the CT process introduced by Hitchcock, abbreviated as OMISTAG[†], the skills for verifying of propositions, in order to accept or reject a claim are taken in consideration. The CT process later presented by Hitchcock, although has a more comprehensive look at this issue, still reflects a skill-based approach(Hitchcock 2018).

Despite the dominance of the skill-based approach over the CT processes, attempts have been made to add elements derived from the humanistic and constructivist school of thought in the process path. Ennis (Ennis 1996), in the CT process abbreviated as FRISCO, points out to the role of situation and context to some extent. He also pays attention to the role of overview and revision of the thinking process in the last step of the CT process, which indicates the role of human's metacognition, in this respect. In agreement with Ennis, Facione(Facione P and Gittens 2015) highlights "scrutinizing", in the CT process abbreviated as "IDEAS"[‡], which confirms the role of reflection and internal control in advancing the process of thinking.

The CT process presented by Hitchcock in 2018, while implicitly mentions some elements derived from humanistic approaches such as the role of "imagination" and "counseling" in the process of CT; however, does not highlight the key role of "context". It also points out the achievement of specific result and the solution as the consequence of the process, which is in contrary to the concepts of uncertainty and pluralism in understanding of CT (Prime 1998).

Derived from the critical theory and pedagogy, the key role of "problem" at the beginning of the CT process has been considered by Ennis (Ennis 2015) in "FRISCO", and by Facione (Facione PA 1995) in "IDEAS". Lipman (Lipman 2003) also emphasizes the importance of "problem seeking" vs. "problem solving". This intellectual skepticism accounts as the basic verdict on which CT process is mounted, leading to paradigm shifts.
In summary, CT process through the lens of paradigms and disciplines, is defined as a process in response to the problem, employs an array of thinking skills,

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[†] O:Overview the message M:Clarify the Meaning I:Inferences S:Structure T:Truth O:Other G:Grade
[‡] I: Identify the problem and set priorities, D:Determine relevant information and deepen understanding E: Enumerate options and anticipate consequences A:Assess the situation and make a preliminary decision S: Scrutinize the process and self-correct as needed

based on intellectual criteria, propulsion by one's mental habits and attitudinal dispositions, dependent on context, under the supervision of metacognition, and influenced by one's creativity and emotions, which do not necessarily lead to a specific response. Repetition of some steps and the round-trip between different stages, socially construction of meaning, flexibility and discourse-oriented ness during the process, are also taken into consideration, in this regard. The framework of CT process, including the multiple conceptualization of CT, is shown in Figure 1.

Conclusion

Multiple perceptions of CT, derived from paradigmatic and disciplinary perspectives, should be mentioned in the CT process, in order to achieve "a strong thinking". A holistic view of this multiplicity in the CT process, seems to be beneficial for medical educators in guiding the learners during the process. Further studies to explore the educational methods that address the development of multiple understanding of CT in students, is recommended.
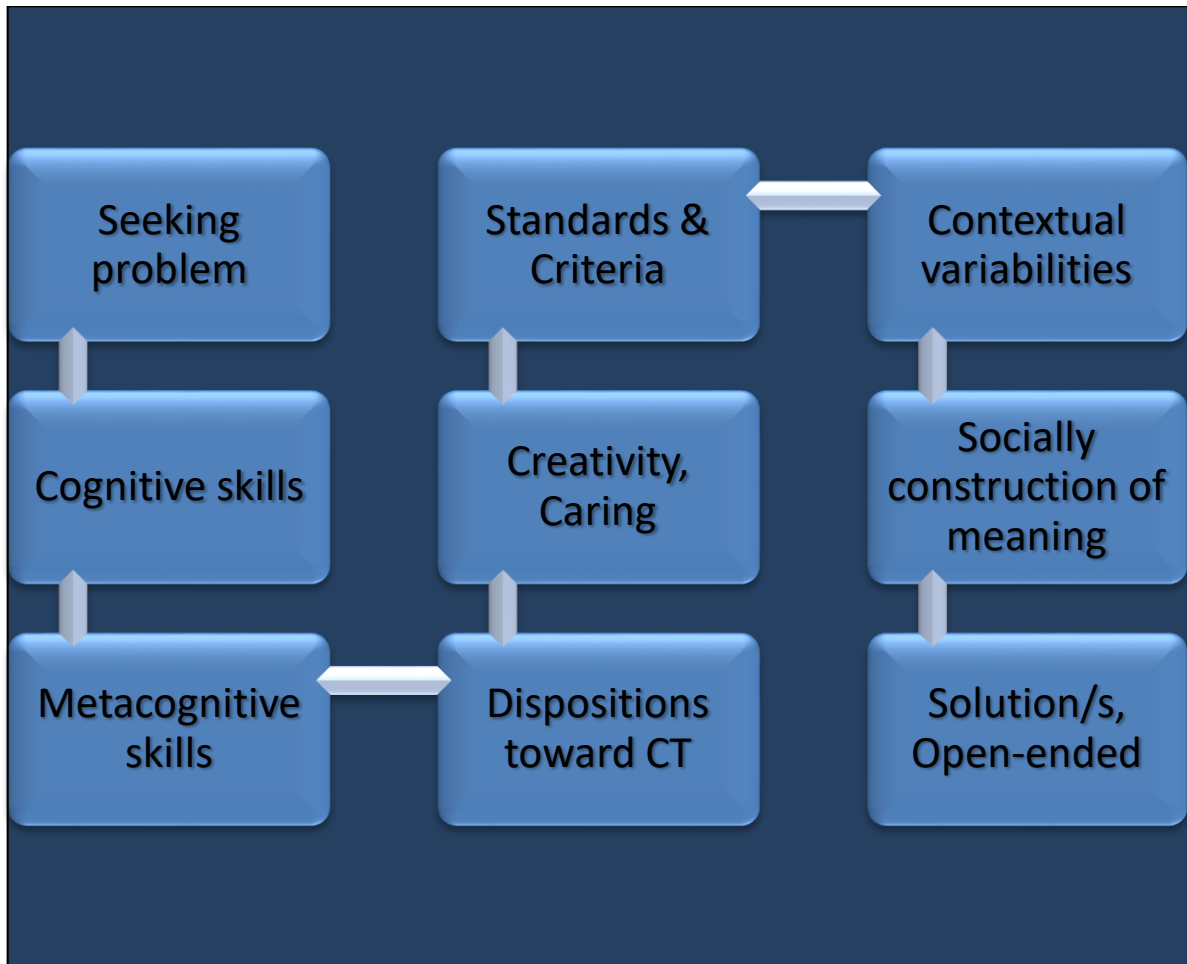

Figure 1. The framework of CT process including multiple conceptualization of CT

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