How thinking works: The challenge of teaching how to think

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Abstract

Rendering students as conscious thinkers is an essential aim of education. Educational endeavours have commonly been aiming at improving students’ critical thinking skills. Nevertheless, the skill performance has appeared to be below the expected proficiency level. Related reports have shown the insufficient understanding of educators about what thinking means to be a factor contributing to this unsatisfactory result. According to reviewed literature here, this understanding level is associated with the imprecise definition that restricts thinking to its conscious aspect. This review suggests reconsidering the definition of thinking in relation to its unconscious aspect, too. A definition consisting of both the conscious and unconscious aspects would enhance the understanding of how thinking works, thereby contributing to the aim.

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1. Introduction

One of the primary objectives of education is to enable students to think consciously, so that they can meet cognitive challenges in their learning and thinking activities, such as problem solving, reasoning, or decision-making, on their own. Notwithstanding the educational endeavours, achievement of the objective has not always been satisfactory. Related studies attribute the lack of clear understanding of educators about what thinking means to the unsatisfactory achievement.

According to reviewed literature here, stressing only the conscious aspect of thinking limits the understanding of how thinking works. Such a focus deprives educators of an understanding about unconscious thinking, which mostly refers to emotional and motivational aspects of information processing. This leads educators to lack awareness of how the unconscious aspect of thinking facilitates or inhibits the conscious thinking activities or their efficiency in teaching students how to think.

This review has two main aims: (a) to examine the question of how thinking works in relation to the insufficient understanding about what thinking means, thereby explaining the relation of imprecise definition of thinking to the unsatisfactory achievement of the objective; and (b) to set out the role of the unconscious in the thinking activities. The review highlights that students cannot always consciously acquire, access, and use knowledge and skills. They cannot persistently be conscious of the interaction between perceptual, cognitive, and emotional/motivational processes of their learning. Therefore, they cannot have constant conscious control over their thought processes.

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Consciously inaccessible parts of this interaction affect their learning and thinking activities. Hence, the unconscious aspect of thinking needs to be taken into account in making a precise definition of thinking for its educational implications.

2. Teaching and Learning How to Think Consciously

The primary aim of educational endeavours is to make desirable changes in human behaviour, in the capacity, process, and outcome of human development. Craft [1] considered achievement of the aim satisfactory when students develop conscious thinking competency. According to Kuhn [2] and Wegerif [3], a considerable amount of related studies could make the desirable changes by teaching students how to think consciously, teaching how to acquire, access, apply, and transfer knowledge and cognitive skills.

Conscious thinking has always been considered necessary to keep students attentive and active in learning activities [4], in which conscious thoughts are verbally reportable, intentional, and controllable [5]. In other words, conscious thinking relies on attentive, intentional, volitional, and controllable processes and utilizes verbal and pictorial information (verbal and non-verbal language), thereby being conducive to better learning and teaching. Dorris [6] reported that conscious awareness and conscious control are needed to regulate thought and learning processes. By virtue of conscious awareness, students gain introspective access to their emotional and motivational states as well as to cognitive activities, thereby behaving intentionally [7]. By virtue of conscious control, they gain voluntary control over the mental processes, controlling their own behaviour. Anderson et al. [8] and Hmelo-Silver [4] suggested improving competency, so that they can be effective in the acquisition of transferable, durable, and applicable knowledge. The value criterion of an improved conscious thinking skill, such as critical thinking, is to enable students (a) to cope with problems within interest domains successfully [9], (b) to identify the problem and obstacles to its solution, (c) to formulate well-reasoned, applicable, and reliable conclusions, and (d) to realize how fallible their own opinions are [10]. Students can hereby become conscious thinkers, as those who have a critical perception of reality, critically analysing their thoughts, beliefs, and acquired knowledge structures. Such students are those who are also able to make coherent sense of continuity between past, present, and prospective experiences, and persuasively complete their cognitive tasks [11].

However, Smith [11], Smythe [12], Ten Dam and Volman [13], and Tsui [14] argued that the educational endeavours are not always effective in enabling students to transfer their improved critical thinking skill to other situations inside and outside of the school environment, this being the most important issue in teaching students how to think consciously. Findings indicated that students at different stages of schooling did not achieve the expected level of understanding complex issues and of problem-solving, management, decision-making, and critical-thinking skills in an educational context of the United States [15], Saudi Arabia [16], Israel [17], Malaysia [18], China [19], and Hong Kong [20]. According to these findings, as well as to Garside [21], Marin and Halpern [15], Marland and Edwards [22], Li [23], Hu et al [24], the insufficient understanding of educators about what thinking, specifically critical thinking, stands for is attributable the unsatisfactory achievement. As Goodrum [25] predicted, this issue recurs in psychological and educational studies whenever educators intend to improve thinking skills of students. Thus, as did Berlak [9], the question is raised whether the definition of thinking in educational literature can be of high value to contribute to satisfactory achievements in teaching students how to think. Heidegger [26] highlighted that a wrong or narrow definition of thinking makes invisible its rich potential.

2.1. What cognitive process is defined as thinking?

Dewey [27] defined thinking as “the accurate and deliberate instituting of connections between what is done and its consequences” (p. 151). According to Raths et al. [28], thinking is human cognitive disposition whereby humans pay deliberate attention to particular aspects of an experience, purposefully exploring that experience. Smythe [12], however, argued that thinking is not necessarily deliberate, explorative, and purposeful. Holyoak and Morrison [29] showed no evidence indicating that thinking is merely conscious, logical, or rational. Thompson et al. [30] found that students deliberately thinking made incorrect decisions; yet, they did not necessarily assess each decision or response to a problem consciously. Evans [31] similarly reported that students purposefully thinking produced normatively incorrect responses.
The imprecise definition of thinking in the literature might lead educators to lack the necessary knowledge. Ryle [32] suggested providing educators with practical knowledge about how to formulate general or specific structures of thinking, thereby helping students ensure the attainment of effective thinking skills. If students could understand how they receive, form, evaluate, or prefer to manipulate information, they would improve their thinking skill performance. Providing students with such a thorough understanding requires educators to know how students process information or think while learning instructional messages, requiring knowledge about how students think during learning how to think [33]. Educators have little or no direct access to what students think of while learning. This obscures a profound understanding of how thinking works [34]. Berlak [9] contended that the identification of general characteristics of conscious thinking, and thus, its precise definition, requires a set of knowledge about how thinking works or how conscious thinking is generated; this is simply not available.

3. How Conscious Thinking Occurs

How neural activities of human organisms generate conscious experience is one of the most controversial issues, as stated by Hohwy [35] and Jack and Shallice [7]. To cast light on this issue, many studies, such as, Dehaene and Naccache [36], Neuman and Nave [37], and Thagard and Aubie [38], looked for neuropsychological evidence indicating (a) whether neural activities in several regions or in an exclusive region of the brain generate conscious experience, (b) what essential characteristics of consciousness are, (c) how semantic memory is organized, and (d) how cognitive processes result in a subjective conscious experience. Overall result of these studies, however, remained unclear, how the mind interacts with various regions of the brain, how information is shared between sensory modalities, cognitive processes, and emotional/motivational functions of the human psyche, and thus, end up with conscious experience.

Kihlstrom [39] argued that the brain structures and functions that are specifically responsible for conscious experience cannot be discovered simply by comparing the normal state of alert to sleep, anaesthesia, or coma because when people are awake, alert, and attentive, they can process some information automatically or unconsciously. Thus, consciousness cannot easily be identified with any particular cognitive functions (e.g., discriminative responses to stimulation, perception, memory, or the higher mental processes involved in judgment or problem solving) because all of these functions can take place without conscious processes, without calling upon awareness, intention, control, and volition.

Block [40, 41] proposed dividing conscious thinking into two aspects, as separate problems, of consciousness: access consciousness and phenomenal consciousness. The former is about neural correlates of consciousness, and the latter is about personal and sociocultural experiences [42]. Access consciousness refers to the problem of how or when the human brain sends information about perceived stimuli to the other cognitive processes, thereby guiding the behavioural and thinking activities. Phenomenal consciousness refers to the issue of how humans recognize what is being experienced [43].

As Brogaard [44] explained, this distinction does not mean that access and phenomenal consciousness are uncorrelated; they are just conceptually independent, but functionally correlated, and the distinction is coherent. However, Rosenthal [45] argued that Block’s distinction between access and phenomenal consciousness is untenable; common sense does not count any state as conscious if the subject is wholly unaware of it. Block [46] agreed that the structure and function of access consciousness is not clear, mainly because humans often lack conscious access to the knowledge of why they are doing what they are doing. This ambiguity raises the question of what qualifies human behaviour as conscious.

4. When Thinking is Conscious

Vandekerckhove and Panksepp [47] drew attention to three distinct forms of consciousness: anoetic (unknowing), noetic (knowing), and autonoetic (self-awareness). The anoetic is the pure information processing capacity by which the human mind unconsciously acquires information about the experience of the body and the world through sensory-perceptual immediacy and affective intensity. It is the simple awareness of external stimuli, not the recognition of what is experienced [48]. This simple awareness does not enable humans to integrate and differentiate what is experienced; thus, it does not require the representation of that experience in a higher form of consciousness (i.e., noetic consciousness). Noetic consciousness refers to the awareness of symbolic representation
of the world, but it does not access the full awareness of on-going subjective experiences. Subsequently, this symbolic representation provides humans with a higher cognitive level, with the capacity for autonoetic consciousness (self-awareness), whereby humans mentally represent and become aware of their existence in a continuing experience [49]. Self-awareness involves a volitional, intentional, attentional, and controllable process that focuses on a selected experience.

Accordingly, a person thinks consciously when he/she mentally represents himself/herself in an interaction with what he/she experiences (mentally representing the interaction between who experiences and what is experienced). Thus, as Lesley [50] articulated, conscious thinking does not stand for sensation, but rather for the self; conscious thinking is not the awareness of what I think or what I feel, but the recognition of how I react to what I think and feel; how I sense what I perceive; how I make meaning of what I mean; how I will what I intend, how I do what I carry out; and how I know what I know. Carruthers (2000) explicated that humans can be aware of, but without recognition of, what they perceive, feel, or sense. Simple awareness of external stimuli does not provide the recognition of what is experienced. The recognition requires conscious awareness [48]. Gawronski et al. (2006) suggested three dimensions of conscious awareness: source, content, and impact awareness. A person may or may not be consciously aware of a causal origin (source awareness) of his/her behaviour, of the behaviour itself (content awareness), and of its influence (impact awareness) on other psychological processes. Kihlstrom et al. [53] highlighted that simple awareness might be necessary for attentive reflection but not necessary for the recognition of causal origins of complex emotional/motivational behaviours, such as wish, desire, and fear.

Thus, what qualifies human behaviour or a subjective experience as conscious is that a person becomes consciously aware of his/her existence (self-awareness) in a continuing experience and of the influence that experience exerts on his/her current and subsequent behaviours (the recognition of a causal origin of his/her behaviour). Hence, the recognition rather than awareness is central to conscious thinking, unlike its traditional conception. According to a conventional conception of conscious thinking, if one’s subjective experience was available to his/her awareness, that experience was deemed a conscious experience; and an experience was not conscious, if it was unavailable to the awareness [54]. However, the new conception leads to the question of whether humans can consciously reflect upon the generative processes of thoughts and behaviours concurrently with the thoughts and behaviours themselves.

4.1. Can students consciously think of generative processes of thoughts and of the thoughts themselves at the same time?

Tomic and Klauer [55] contended that, unless self-awareness in relation to what is experienced and to motivational/emotional states is stimulated, a student does not think consciously. Brown [56] pointed out that students need to be consciously aware of what they think of when performing a cognitive task, such as planning, so that they can initially organize their plans and later adjust their actions based on the results achieved from the task. However, the prerequisite of the task for self-awareness exacerbates the issue of teaching and learning how to think. Students frequently lack conscious awareness and conscious control over their thinking activities, including the acquisition, access, and application of knowledge and cognitive skills.

According to Lewis [57], one can consciously reconstruct, analyse, or reflect on only his/her thinking outcomes (e.g., thoughts, ideas, decisions, or problems) but not on the processes of thinking at the same time. Humans cannot reflect upon the generative processes of thoughts concurrently with the thoughts themselves. One’s conscious awareness or conscious control is limited and not equipped to access and manage simultaneously the enormous complexity of the perceptual, cognitive, and emotional processes that lay the foundation of the outcomes [58], [59]. The implementation of the outcomes can later be available to conscious awareness and control [6]. The outcomes can be accepted or rejected using conscious thinking activities, such as logical reasoning or rationalization.

Furthermore, in developing and organizing thoughts, students often unconsciously act upon their motivational evaluations based on what is emotionally desired or undesired. Such desire-based evaluations interfere with the rational selection of their behaviours [60]. Students tend to unconsciously avoid undesired explanations and retain desired ones to serve their needs. This tendency unconsciously guides their thought processes, including preferences, inferences, beliefs, and goals. In these processes, as Kihlstrom [61] maintained, not just thoughts but thinking itself can be unconscious.
5. Conscious Thinking under the Effect of Unconscious Affective Thought Processes

Humans are usually unaware of most emotions underlying their motivated behaviour. Therefore, they can often come up with reasons for their behaviour that do not match the real causes of why they did or did not do something [62], [63]. If people always knew the reasons or causes, much of their behaviour would no longer be able to fulfil the function of helping them survive. Individuals cannot always consciously control every emotional or cognitive response, but they can become aware of an unconsciously initiated one [64]. Although humans can become aware of the response, they can still be unaware of reasons moulding their positive and negative evaluations or reactions [65].

Accordingly, students are not necessarily in control of their thoughts at any time. In fact, thoughts can be uncontrollable [66]. Thoughts always run around the mind and become infused into emotions, thereby provoking human behaviours. Students are therefore not always consciously aware of how their attention is being split and how the shifts in the level of knowledge transference occur. They are unable to articulate how it happens [22]. They usually give explanations by creating meanings that rely on their own subjective experiences and needs [34].

An unwanted thought can easily exceed one’s conscious control and influence his/her behaviour [67]. Such a thought can contain emotional/motivational values and engage in an instructed problem-solving task in which it does not stimulate but rather inhibits the evaluation process of the task [68]. Although providing students with the knowledge of how to think consciously allows students to use the knowledge and successfully deal with the task, students are not necessarily conscious of the transference and application of that knowledge. This often happens unconsciously either in social [69] or educational environments [70]. Yet, emotional/motivational factors, such as wish, anxiety, fear, urge, or interest, can obstruct the conscious access and application of the knowledge [71], particularly when students are under uncertain conditions and time pressures [72].

According to Velmans [73], a person who strives to think consciously has little or nothing to do with the does not always provide great support for keeping their feelings, impressions [74], and prior beliefs from influencing their causal attributions in a typical cognitive task, such as problem solving [75], reasoning [76], [77], or inference [78]. Even if they become conscious of this influence, there would concurrently be new inferences of which they are not yet conscious [78]. In particular, prior beliefs guide the information evaluation of the tasks, and this is not less effective than the guidance of logical reasoning [79]. Evans [80], therefore, attributed the bulk of cognitive task performance to unconscious processes, such as heuristic and tacit knowledge.

Although one can be conscious of his/her emotional states, such as fear, sadness, anger, embarrassment, happiness, envy, or pride [38], such consciousness is limited to the extent that humans are unable to respond to every piece of information consciously or to recognize all features and patterns of information simultaneously. Therefore, people need to process or discern multiple patterns of information unconsciously in parallel with the conscious processes [81]. The unconscious processes enable humans to integrate various information patterns simultaneously and to create associations with the consciously discerned information stored in permanent memory [82]. The unconscious processes can form, retain, and recall information either in the absence or in the presence of conscious thinking [83]. As such, taking these roles of unconscious thought processes into consideration in necessary for better understanding of conscious thinking, shedding light on the issue of what is called thinking.

6. Definition of Thinking in Relation to its Educational Implication: The Need for Reconsideration

According to Schunk and Zimmerman [84], the improvement of students’ conscious thinking competency or the enhancement of their understanding transcends what the literal information could offer. Although the improvement helps students (a) reflect on their personal behaviours, attitudes, wishes, or desires; (b) acquire and access knowledge; (c) adapt themselves to their environment; and (d) weigh their personal and social experiences against each other, these cognitive processes are not necessarily conscious, nor are conscious processes necessary criteria for experiencing, knowing, and thinking [50], [12]. A series of studies, such as Ball and Little [85], Berntsen and Jacobsen [86], Mace [87], described that neither the acquisition of new knowledge, nor the retrieval of information stored in long term memory necessarily requires conscious awareness, control, and volition.

Furthermore, conscious thinking does not necessarily produce creative ideas and decisions. Scott and Dienes [88] showed that unconscious thought outperformed conscious thought at judgment, decision-making, and attribution tasks. Similar findings replicated by Dijksterhuis and Meurs [89] and Ritter et al. [90], indicated that unconscious
thoughts were more creative and effective than conscious thoughts in the same task. Tulving [91] maintained that any subjective experience, a goal-directed or intentional process, such as the generation of meaning, cannot escape the need for unconscious thinking/processing information. Unconscious thoughts actively contribute to making a decision or solving a problem before that decision or problem becomes conscious [92].

Therefore, the definition of thinking for educational practices should also cover its unconscious aspect, not to be restricted to its conscious aspect. As Freud [93] and Erdelyi [94] highlighted, any explanation for the conscious mind inevitably opens up the role of the unconscious mind in every psychical act. A conscious experience without a preliminary unconscious stage is still not amenable to a scientific measure. There is no evidence indicating that a conscious reflection precedes an unconscious reflection and influences nerve cell activities in the brain. Neuropsychological evidence indicates that a specific neural activity in the brain for an unconscious behaviour precedes the conscious one, but not vice versa [64]. One can infer the unconscious from its effects on behaviours (decisions, thoughts, or desires), but not directly with full conscious awareness. Hence, the definition of thinking according to both stages yields better understanding of how thinking works and how students can consciously interfere with the effect of the preliminary stage (reflecting on the unconscious emotional/motivational effects on their conscious thinking activities).

7. Conclusion

This review has aimed at pointing out the challenge of the definition of thinking, as it concerns teaching students how to think consciously. Reviewed studies have stressed several issues that exacerbate the challenge: how thinking works and how conscious thinking operates on emotional/motivational values of thoughts or surrounding stimuli. These issues lead to ambiguity in what conscious thinking is and what the improvement of conscious thinking competency means.

Thinking is usually conceived to be a conscious process in educational implications, in which only the conscious thinking is stressed, but little or no attention is paid to the unconscious thinking potency. Conscious process is not the only generator of thinking. Unconscious thinking occurs as well. An effective teaching approach should therefore not consider consciousness as the only pathway of thinking, but also include the potentiality of thinking outside of consciousness. A teaching approach that restricts thinking to consciousness would lead to a paucity of knowledge about how thinking works. This restriction might be a reason that prevents educators from a profound understanding of what thinking, specifically, critical thinking means. Reviewed studies have ascribed the insufficient understanding to the unsatisfactory achievement in teaching students how to think consciously.

The reviewed literature on consciousness and thinking has emphasized that humans cannot always be conscious thinkers, having conscious awareness and conscious control of their emotional/motivational states (cannot constantly monitor and intervene in perceptual, cognitive, motivational/emotional processes), or having conscious access and application of acquired knowledge and cognitive skills. Thus, teaching students how to think does not necessarily mean providing students with ever accessible, applicable, and transferable conscious awareness, conscious control, conscious knowledge, and consciously acquired cognitive skills (i.e., conscious thinking). This review has, therefore, particularly called attention to the limited capacity of conscious thinking in relation to the unlimited capacity of unconscious thinking/processing information. The review suggests facilitating both conscious and unconscious occurrence of thinking rather than encouraging students to memorize the instructions about how to think consciously. Students would hereby be able to reflect upon the product of unconscious thinking.

References


