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BETTER LEARNING THROUGH METACOGNITIVE MONITORING: DEVELOPING STUDENTS' CRITICAL THINKING

Better level of students' performing in university is closely related to the level of effort they put forth in their academic work. Many students do not always aware of the strategies of studying, thus depriving themselves of the opportunity to reason out their difficulties and discover their capabilities. The aim of the paper is to consider the notions "metacognitive monitoring" and "critical thinking" and to analyze the connection between metacognitive monitoring and students' critical thinking. This article describes how students through metacognitive monitoring can acquire new habits of thoughts and qualities of mind which will enable them to become autonomous learners.
Key words: metacognitive monitoring, critical thinking, metacognition, learning.

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ПІДВИЩЕННЯ ЕФЕКТИВНОСТІ НАВЧАННЯ ЗА ДОПОМОГОЮ МЕТАКОГНІТИВНОГО МОНІТОРИНГУ: РОЗВИТОК КРИТИЧНОГО МИСЛЕННЯ СТУДЕНТІВ

Ефективність навчання студентів пов'язана з їхніми зусиллями в процесі здобуття знань. Значна кількість студентів не завжди усвідомлює стратегії навчання, позбавляючи себе можливості проаналізувати свої труднощі та виявити власні можливості.
У статті здійснено теоретичний огляд понять «метакогнітивний моніторинг», «критичне мислення» та проаналізовано зв'язок між ними. Розглянуто роль метакогнітивного моніторингу у формуванні особливостей мислення студентів.
Ключові слова: метакогнітивний моніторинг, критичне мислення, метапізнання, навчання.

Introduction. Metacognitive monitoring and critical thinking continue to be important topics in the scientific literature. The students' learning regulation represents a significant issue of learning psychology research. Metacognitive monitoring of ongoing cognitive processing (learning, problem-solving) is a key component of learning regulation (Nietfeld et al., 2005; Frumos, 2015).

The acquisition of critical thinking skills has for decades been a highly valued outcome of higher education; yet, instructors continue to question whether their pedagogical practices promote the acquisition of these important skills (Bensley & Spero, 2014).

Critical thinking also involves evaluating the thinking process−the reasoning that went into the conclusion one arrived at or the kinds of factors considered in making a decision. In the term critical thinking, the word critical is not meant to imply «finding fault», as it might be used in a pejorative way to describe someone who is always making negative comments. It is used instead in the sense of «critical» that involves evaluation or judgment, ideally with the goal of providing useful and accurate feedback that serves to improve the thinking process (Halpern, 1998).

The role of metacognitive monitoring and critical thinking were engaged by scholars such as Schoen (1983) (the relation between critical thinking and metacognition seen as «a successful pedagogy aiming the enhancement of thinking would incorporate ideas about the way in which learners organize knowledge and internally represent it and the way these representations change and resist change when new information is encountered»), Facione (1992) (critical thinking is positively correlated with metacognition; «improvements in one are parralled by improvements in other»), Halpern (1998) (analyzed the connection between critical thinking and metacognitive skills of students), Lockwood (2003) (metacognition and critical thinking lead to high levels of cognition; critical thinking and metacognition are strongly linked to developing active participation of all levels of knowledge), Kuhn & Dean (2004) (critical thinking entails awareness of one's own thinking and reflection on the thinking of self and others as an object of cognition), Choy & Cheah (2009) (critical thinking involves a higher level of metacognitive ability or entails the employment of a higher level of cognitive skills such as metacognition in

information process), Ku & Ho (2010) and Magno(2010) (critical thinking performance involves not only various reasoning skills but also critical thinking dispositions and metacognition), Bensley & Spero (2014) (explicit critical thinking instruction may affect the acquisition of critical thinking and metacognitive monitoring).

The aim of the manuscript is to analyze the connection between metacog-nitive monitoring and students' critical thinking.

Research methods. The article used a set of theoretical methods corresponding to the content of the problem. The theoretical and methodological analysis of the problem, the systematization of scientific psychological sources and data generalization were used in this manuscript.

Conception of Metacognitive monitoring and Critical thinking. Metacognitive monitoring plays a central role in the development of self-regulated learning. Effective monitoring is important for student learning because it aids students in keeping track of ongoing cognitive processes and using regulatory strategies to solve problems. It also assists in managing the learning process through effective allocation of attention, memory, and time when studying or completing an academic assignment (Nietfeld et al., 2005).

Metacognitive monitoring in the process of learning activity shows us how well students are able to imagine the possibilities and limits of their own cognition in the process of solving various types of cognitive (motor, sensory-perceptual, mnemonic, thinking) and educational and professional problems, how effective are operations, which they use to regulate educational and cognitive activity (Shovkova & Pasichnyk, 2019).

Monitoring is a data-driven process that provides self-generated feedback for students to control their learning and performance. The ability to monitor performance accurately alerts students of their need to adjust to the learning environment and make tactical decisions regarding their education (Nietfeld et al., 2005).

Metacognitive monitoring is viewed as the way of checking students' cognitive activity and how these results direct to the solution of certain cognitive tasks, such as recalling answers, doing tests, and reading texts (Savin & Fomin, 2013). It is also viewed as human evaluation of his/her own knowledge, knowledge of cognitive strategies, and knowledge of conditions that affect the learning process (Koriat, 1993; Valdez, 2013); or as explicit judgments that facilitate the development of cognitive processes (Serra & Metcalfe, 2009). Separate aspects of metacognitive monitoring reliability are studied by Maki and Berry (1984) (metacomprehension of text material), Epstein, Glenberg, and Bradley (1984) (contribution of text variables to the illusion of knowing), Nelson and Narens (1990) (metamemory), Koriat (1993; 1997) (the accessibility model of the feeling of knowing; a cue-utilization approach to judgements of learning), Pulford (1996) (overconfidence in human judgements), Ilyina (2003) (learning motivation), Niet-feld, Cao and Osborne (2005) (metacognitive monitoring accuracy and student performance), Karpov and Skitiaeva (2005) (metacognitive processes of personal identity), Dubovitskaia (2005) (learning motivation), Moore and Cain (2007) (overconfidence and underconfidence), Zabrucky, Lin, and Agler (2008) (metacognition and learning), Parkinson (2009) (metacognition and word learning), Schraw (2009) (conceptual analysis of metacognitive monitoring), Savin and Fomin (2013) (cognitive aspects of education), Dotsevych (2013) (diagnosis of metacognitive competence) (Avhustiuk et al., 2018; Balashov et al., 2018).

Metacognitive monitoring is the executive or «boss» function that guides how students use different learning strategies and make decisions about the allocation of limited cognitive resources. It improves the thinking and learning process, refers to the self-awareness and planning functions that guide the use of thinking skills. Metacognitive monitoring skills need to be made explicit and public so that they can be examined and feedback can be given about how well they are functioning (Halpern, 1998).

Metacognitive monitoring includes «ease of learning judgements», «judgements of learning», «feeling-of-knowing judgement», and «confidence in retrieved answers» (Nelson & Narens,1994), providing the personal insight (albeit with occasional intellectual discomfort) needed to adapt skills to novel situations: The good student may be one who often says that he does not understand, simply because he keeps a constant check on his understanding (Maudsley & Strivens, 2000).

Research indicates that improving metacognitive knowledge and skills is a complex and challenging process. Many individuals lack the metacognitive skills necessary to carry out this strategic approach. Unfortunately, accurate monitoring by students is not always a given. For example, a person who has knowledge about comprehension processes and effective comprehension strategies is likely to maintain the information and yet may not actually apply the knowledge to evaluate comprehension during reading or use strategies when needed. Although most students have metacognitive knowledge about their learning, they do not choose to apply this knowledge to better their test performance. In many cases, even skilled adult learners are poor monitors under certain conditions. Given these findings, it is particularly important to focus research efforts on the factors that affect the variability and malleability of monitoring accuracy levels. Accurate monitoring leads to important outcomes with regard to self-regulation and performance in learning (Nietfeld et al., 2005).

As a metacognitive process, monitoring is more or less reliable, closer to or further from the actual performance, therefore monitoring is accurate to various degrees (Nietfeld et al., 2005; Frumos, 2015).

Critical thinking is the indispensable part for the construction of metacognition (Flavell, 1979; Kuhn, 1999) because it involves «awareness of one's own thinking» and ref-lection on the thinking of self and others as an object of cognition (Çakıcı, 2018).

The cultivation of the ability to think critically deserves to be investigated as one of the ultimate missions of education in the 21st century. Within the changing landscape of learning, critical thinking as a rapidly growing concept in education is believed to be the most salient skill and highly needed to be acquired. The information flow of today's global learning views thinking critically as «judging in a reflective way what to do or what to believe» (Facione, 2000). It is extremely noticeable that as a metacognitive process, the study of critical thinking has blossomed in the psychological framework of educational literature. Conceptually, critical thinking refers to «inquisitiveness, open-mindedness, systematicity, analyticity, truth-seeking, critical thinking self-confidence, and maturity» (Facione, 2007). In this regard, critical thinking, by definition, is a complex process that entails the use of higher levels of cognitive skills in the information process (Choy & Cheah, 2009). In that process, it is needed to reflect on what is known and how that knowledge is justified, as well. Critical thinking is attributed to have crucial characteristics of higher order thinking skills. Once again, (Facione, 1990) proposes that critical thinking is «purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or conceptual considerations upon which that judgment is based».

From this perspective, critical thinking as the intentional application of rational and higher order thinking skills, such as analysis of arguments, problem recognition and problem-solving, making inferences using inductive or deductive reasoning, judging or evaluating. In the words of Halpern (1998), critical thinking is «the use of cognitive skills or strategies that increase the probability of a desirable outcome». Pascarella & Terenzini (1991) theorized that «…critical thinking involves the individual's ability to: identify central issues and assumptions in an argument, recognize important relationships, make correct inferences from data, deduce conclusions from information or data provided, interpret whether conclusions are warranted on the basis of the data given, and evaluate evidence or authority» (Çakıcı, 2018).

As an influential factor in the development of critical thinking abilities, metacognition requires the deployment of higher order thinking skills. Similarly, critical thinking is a higher order thinking activity that requires a set of cognitive skills as follows the ability to define and focus on a problem to understand and judge the validity and consistency of the hypothesis and information. Apparently, most educators today favor the view that critical thinking is a higher-order process. It is also questioned how it is associated with other mental processes based on these premises above (Çakıcı, 2018).

Critical thinking is defined by three characteristics:

• it is self-corrective thinking (self-corrective procedures are responsible for the emergence of logic);

• it is thinking with criteria (every reason presupposes a criterion as necessarily as every angle subtends an arc);

• it is thinking that is sensitive to context (it involves: recognition of exceptional or irregular circumstances and conditions; special limitations, contingencies or constraints; overall configurations; the possibility that evidence is atypical; the possibility that some meanings do not translate from one context or domain to another) (Lipman, 1988).

Halpern summarized the goals of critical thinking as:

• to recognize propaganda;

• to analyze hidden assumptions in arguments;

• to recognize deliberate deception;

• to assess the credibility of information;

• to work through problems/decisions in the best way.

Halpern attributed to critical thinkers the characteristics of flexibility, persistence and a willingness to plan, self-correct, be aware of their own thought processes (metacognitive monitoring) and be consensus seeking (Halpern,1996).

The goal of helping students improve their critical-thinking abilities represents a major change in the way the teaching and learning process is viewed. The term critical thinking refers to the use of those cognitive skills or strategies that increase the probability of a desirable outcome − in the long run, critical thinkers will have more desirable outcomes than «noncritical» thinkers (where «desirable» is defined by the individual, such as making good career choices or wise financial investments). Critical thinking is purposeful, reasoned, and goal-directed. It is the kind of thinking involved in solving problems, formulating inferences, calculating likelihoods, and making decisions. Critical thinkers use these skills appropriately, without prompting, and usually with conscious intent in a variety of settings. That is, they are predisposed to think critically. When people think critically, they are evaluating the outcomes of their thought processes–how good a decision is or how well a problem is solved (Halpern, 1996).

The literature on critical thinking has roots in two primary academic disciplines: philosophy and psychology. Sternberg (1986) has also noted a third critical thinking strand within the field of education. These separate academic strands have developed different approaches to defining critical thinking that reflect their respective concerns. Each of these approaches is explored more fully below.

Philosophical tradition emphasizes qualities or standards of thought. For example, Bailin (2002) defines critical thinking as thinking of a particular quality – essentially good thinking that meets specified criteria or standards of adequacy and accuracy. Further, the philosophical approach has traditionally focused on the application of formal rules of logic. One limitation of this approach to defining critical thinking is that it does not always correspond to reality (Sternberg, 1986). By emphasizing the ideal critical thinker and what people have the capacity to do, this approach may have less to contribute to discussions about how people actually think (Lai, 2011).

The cognitive psychological approach contrasts with the philosophical perspective in two ways. First, cognitive psychologists, particularly those immersed in the behaviorist tradition and the experimental research paradigm, tend to focus on how people actually think versus how they could or should think under ideal conditions (Sternberg, 1986). Second, rather than defining critical thinking by pointing to characteristics of the ideal critical thinker or enumerating criteria or standards of «good» thought, those working in cognitive psychology tend to define critical thinking by the types of actions or behaviors critical thinkers can do. Typically, this approach to defining critical thinking includes a list of skills or procedures performed by critical thinkers (Lai, 2011).

Benjamin Bloom (1956) and his associates work in the educational approach. Their taxonomy for information processing skills is one of the most widely cited sources for educational practitioners when it comes to teaching and assessing higher-order thinking skills. Bloom's taxonomy is hierarchical, with «comprehension» at the bottom and «evaluation» at the top. The three highest levels (analysis, synthesis, and evaluation) are frequently said to represent critical thinking (Huitt,1998; Kennedy et al., 1991; Lai, 2011).

The benefit of the educational approach is that it is based on years of classroom experience and observations of student learning, unlike both the philosophical and the psychological traditions. However, some have noted that the educational approach is limited in its vagueness. Concepts within the taxonomy lack the clarity necessary to guide instruction and assessment in a useful way. Furthermore, the frameworks developed in education have not been tested as vigorously as those developed within either philosophy or psychology (Lai, 2011; Sternberg, 1986).The detailed information is given in Table1.

Table 1.

Approaches to critical thinking

Apro-aches	Definition of critical thinking	Names of scholars
Philosophical tradition	reflective and reasonable thinking that is focused on deciding what to believe or do	Ennis,1985
	skillful, responsible thinking that facilitates good judgment because it 1) relies upon criteria, 2) is self-correcting, and 3) is sensitive to context	Lipman,1988
	a way of reasoning that demands adequate support for one's beliefs and an unwillingness to be persuaded unless support is forthcoming	Tama, 1989
	purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or conceptual considerations upon which that judgment is based	Facione,1990
	active, systematic process of understanding and evaluating arguments	Mayer & Goodchild, 1990
	the propensity and skill to engage in an activity with reflective skepticism	McPeck,1990
	disciplined, self-directed thinking that exemplifies the perfections of thinking appropriate to a particular mode or domain of thought	Paul,1992
	thinking that is goal-directed and purposive, «thinking aimed at forming a judgment, where the thinking itself meets standards of adequacy and accuracy»	Bailin,1999
	judging in a reflective way what to do or what to believe	Facione, 2000
Cognitive psychological approach	the mental processes, strategies, and representations people use to solve problems, make decisions, and learn new concepts	Sternberg, 1986
	the ability to analyze facts, generate and organize ideas, defend opinions, make comparisons, draw inferences, evaluate arguments and solve problems	Chance,1986
	the use of those cognitive skills or strategies that increase the probability of a desirable outcome	Halpern, 1998
	seeing both sides of an issue, being open to new evidence that disconfirms your ideas, reasoning dispassionately, demanding that claims be backed by evidence, deducing and inferring conclusions from available facts, solving problems, and so forth	Willingham, 2007
Educational approach	Bloom's taxonomy – three highest levels (analysis, synthesis, and evaluation)	Bloom,1956

Definition of critical thinking varies. Nevertheless, the existing literature shares the consensus that critical thinking involves cognitive, dispositional and metacognitive components; together they denote good critical thinking perfor-mance. The cognitive component has been represented by the mental capability to comprehend a problem as well as the ability to apply cognitive skills to make sound judgments. Cognitive skills acknowledged as central to critical thinking ran-ge from a few to many; typically these include analyzing arguments, recognizing logical fallacies, distinguishing warranted and unwarranted claims, identifying un-derstated assumptions and skills in scientific analytical reasoning. On the other hand, a person's disposition exerts an influence on the patterns of one's intellectual activity. Enjoyment of thinking, an open attitude, a careful approach in thinking and a mindset for truth are essential for a person to reach sound judgments (Ku & Ho, 2010).

Results and discussion. On the contrary, there have been fewer researches investigating the meta-cognitive component in critical thinking. The use of metacognitive strategies has been frequently discussed at the conceptual level as an important factor affecting critical thinking. Metacognitive strategies are thought to invoke behaviors that enable students to supervise and control their thinking processes. Thus, it has been argued that students need to be trained and examined on the use of these strategies. Commonly suggested metacognitive strategies used in critical thinking fall under three categories: planning, monitoring, and evaluating. Examples of planning activities include those aiming at the determination of procedures that direct thinking, the selection of appropriate strategies, and the allocation of available resources. Monitoring refers to an ongoing awareness of task comprehension. Monitoring activities include checking task information to validate comprehension, allocating attention to important ideas, and pointing out informational ambiguities. Evaluating strategies involve the examination and correction of one's cognitive processes.These include evaluating one's reasoning, goals, and conclusions as well as making revisions when necessary. In sum, a critical thinker is one who is in charge of his thinking processes, while metacognitive strategies enable such control to take place (Ku & Ho, 2010).

Critical thinking occurs when individuals use their cognitive skills or strategies that increase the probability of a desirable outcome. Specifically, deve-loping students' critical thinking skills are facilitated through metacognition. The relationship between metacognition and critical thinking was initially asserted up by Schoen (1983) where he explained that «a successful pedagogy that can serve as a basis for the enhancement of thinking will have to incorporate ideas about the way in which learners organize knowledge and internally represent it and the way these representations change and resist change when new information is encountered». In his explanation, the enhancement of knowledge is referred to as critical thinking and the process of organizing knowledge can be a factor of metacognition. After more than a decade, Halpern's four-part model showed metacognition and critical thinking together in a model. A 4-part empirically based model is proposed to guide teaching and learning for critical thinking: (a) a dispositional component to prepare learners for effortful cognitive work, (b) instruction in the skills of critical thinking, (c) training in the structural aspects of problems and arguments to promote transcontextual transfer of critical-thinking skills, and (d) a metacognitive component that includes checking for accuracy and monitoring progress toward the goal (Halpern,1998). Furthermore, she explained that metacognition is the ability to use knowledge to direct and improve thinking skills. When engaging in critical thinking, students need to undergo specific metacognitive skills like monitoring their thinking process, checking whether progress is being made toward an appropriate goal, ensuring accuracy, and making decisions about the use of time and mental effort. This implies evidently that critical thinking is a product of metacognition which provides a direction in the prediction of the two variables. However, the framework proposed by Halpern (1998) was not empirically tested further. She recognized that there are identifiable and definable thinking skills that students can apply appropriately and if these thinking skills are recognized and applied, the students will be more effective critical thinkers (Magno, 2010).

As for metacognition, it is defined in similar terms as awareness and management of one's own thought (Kuhn & Dean, 2004). In fact, it has been perceived that critical thinking involves a higher level of metacognitive ability or entails the employment of higher level of cognitive skills such as metacognition in information process (Choy & Cheah, 2009). Further to this, critical thinking is likely to be developed through metacognition (Schoen, 1983; Magno, 2010). A massive body of research literature has proven the remarkable relation between metacognition and critical thinking (Schoen, 1983; Halpern, 1998; Choy & Cheah, 2009; Kuhn & Dean, 2004; Magno, 2010). Critical thinking and metacognition are strongly linked to develop active participation of all levels of knowledge. Critical thinking entails the processes of actively questioning and analyzing information to gain knowledge. As for metacognition, it necessitates being aware of what you know and do not know at various levels of cognition, and strategies to control the learning process. How and why questions make students to realize and understand the material. They easily and efficiently make decisions for what learning strategies they will employ to answer higher level questions (Lockwood, 2003). In other words, metacognition helps learners make adjustments in plans and strategies accordingly during the critical thinking process. In this regard, metacognition is so significant for a person's development of critical thinking since it may provide an incentive to develop his/her critical thinking. Clearly, metacognition and critical thinking lead to high levels of cognition or thinking skills like reasoning, long term remembering, and analyzing provide greater success in idea formation, decision

making and problem-solving (Lockwood, 2003). Meanwhile, critical thinking is the ability of an individual to think critically regarding his own thinking known as metacognition. Based on the previous research, it is maintained that critical thinking is positively correlated with metacognition; «improvements in one are paralled by improvements in other» (Facione,1992;Çakıcı, 2018).

Halpern suggested a four-part model of instruction for critical thinking. The last element of critical thinking instruction is metacognitive monitoring which refers to how the student uses this knowledge to direct and improve the thinking and his/her learning process. When the students are engaged in critical thinking, they need to employ particular metacognitive skills as follows: monitoring their thinking process, checking that progress is being made toward a suitable goal, ensuring accuracy, and making decisions about the use of time and mental effort (Halpern, 1998).

Similarly, Kuhn & Dean represent that critical thinking entails awareness of one's own thinking and reflection on the thinking of self and others as an object of cognition. Thus, metacognition is identified as awareness and management of one's own thought (Kuhn & Dean, 2004). Schoen posits the relation between critical thinking and metacognition as follows «a successful pedagogy aiming the enhancement of thinking would incorporate ideas about the way in which learners organize knowledge and internally represent it and the way these representations change and resist change when new information is encountered» (Schoen,1983). In the research literature, critical thinking that has received relatively little attention from language educational philosophers. Similarly, there has been limited empirical research that directly investigates the employment metacognitive and critical thinking skills in a foreign language context. Therefore, based on the theoretical assumptions mentioned elaborately above, it is expected that the critical thinking skills would be associated positively with metacognition (Çakıcı, 2018).

To understand the differences underlying individuals' abilities to think critically, it is important to examine the approaches that people adopt to manage and execute different tasks. In fact, the need to disclose individuals' thinking processes for comparison has been emphasized by a number of scholars (Halpern; Mayer). In particular, the use of metacognitive strategies has been put forth as a crucial variable during thinking processes (Facione,1990; Halpern, 1998). For instance, Halpern (1998) states that «when engaging in critical thinking, students need to monitor their thinking process, checking whether progress is being made toward an appropriate goal (and) ensuring accuracy…. Metacognitive monitoring skills need to be made explicit and public so that they can be examined». Facione also emphasizes the importance of self-consciously monitoring «one's cognitive activities, the elements used in those activities and the results educed» (Facione,1990). In Swartz's (2003) reflection on teaching methods that facilitate critical thinking, there is the claim that «thinking about their thinking has dramatic effects on students' learning and is usually not a difficult or complicated task for even primary-level children» (Ku & Ho, 2010).

Despite these assertions, there has been limited empirical research that directly examines individual differences in the use of metacognitive strategies during critical thinking. The foremost reason is perhaps that it is methodologically difficult to collect direct data on ongoing cognitive processes that are complex in nature, with independent and clearly defined elements being teased out for analysis (Ku & Ho, 2010).

A critical thinker is one who applies appropriate skills and strategies to achieve a desirable outcome (Halpern, 1998). Critical thinking demands strategic use of cognitive skills that best suit a particular situation, as well as active control of one's own thinking processes for well-justified conclusions. Psychologists and educators strive to understand what differentiates those who think critically and those who fail to do so; however, it has not been an easy task due to the complexity of human thinking processes. As a result, tests of critical thinking usually measure the end-results of thinking processes, i.e., the quality of the conclusion drawn. However, such indexes of thought products give virtually no information on how the person approached the task, what strategies were used, how a conclusion was reached and what the reasoning behind was – this kind of information would reveal real-time executive processes in thinking and is crucial for our understanding of what leads to good thinking results (Ku & Ho,2010).

Research shows that critical thinking performance involves not only various reasoning skills but also critical thinking dispositions and metacognition (Ku & Ho, 2010; Magno, 2010). Although many theorists have linked critical thinking skills with metacognition (Halpern, 1998; Tarricone, 2011), few studies have examined how explicit critical thinking instruction may affect the acquisition of critical thinking and metacognitive monitoring (Bensley & Spero, 2014).

Numerous studies have shown that explicit instruction is effective in promoting the acquisition of critical thinking skills. Although the research on skills and explicit instruction has increased understanding of what makes critical thin-king instruction effective, a focus on skills alone is incomplete because critical thinking is a multi-dimensional construct (Bensley & Spero, 2014).

For example, when learners are required to provide reasons and evidence to support a conclusion and counter-reasons and conflicting evidence that refute the conclusion, they must focus on the quality of their thinking. They also have to consider both positive and negative evidence. It is well documented that we tend to weigh

evidence much more heavily when it favors a belief that we hold over evidence that disconfirms a personal belief (Halpern,1998; Lilienfeld et al., 2009).

Conclusions. Acquiring critical thinking skills is important because they provide the means for students to question assumptions, analyze arguments, and evaluate the quality of information inside and outside of their chosen fields (Bensley & Spero, 2014).

The improvement of student thinking − from ordinary thinking to critical thinking − depends heavily on the ability of such students to identify and cite good reasons for the opinions they utter (Lipman, 1988).

In the jargon of cognitive psychology, metacognitive monitoring serves the executive function of directing the thinking process. It is made overt and conscious during instruction, often by having instructors model their own thinking process so that the usually private activity of thinking is made visible and open to scrutiny (Halpern, 1999).

The literature on metacognition suggests that having students practice metacognitive monitoring consistently should lead to a significant improvement over time (Frumos, 2015). When engaging in critical thinking, students need to monitor their thinking process, checking whether progress is being made toward an appropriate goal, ensuring accuracy, and making decisions about the use of time and mental effort. A few explicit guiding questions can be used as a way of converting what is usually an implicit process into an explicit one. For example, students can be given a problem or an argument to analyze and then asked the following questions before they begin the task: (a) How much time and effort is this problem worth? (b) What do you already know about this problem or argument? (c) What is the goal or reason for engaging in extended and careful thought about this problem or argument? (d) How difficult do you think it will be to solve this problem or reach a conclusion? (e) How will you know when you have reached the goal? (f) What critical thinking skills are likely to be useful in solving this problem or analyzing this argument? As students work on the problem or argument, they should be asked to assess their progress toward the goal. (g) Are you moving toward a solution? Finally, when the task is completed, the students should be asked to judge how well the problem was solved or how well the argument was analyzed. Well-structured questions will help students reflect on their learning and may provide insights that will be useful in the future (Halpern, 1998).

When engaging in critical thinking, you will need to monitor your thinking process, check whether progress is being made toward an appropriate goal, ensure accuracy, and make decisions about the use of time and mental effort. Numerous studies have found that good learners and thinkers engage in more metacognitive activities than poor learners and thinkers and that the skills and attitudes of metacognitive activities can be taught and learned so that students can direct their own learning strategies and make judgments about how much effort to allocate to a cognitive task (Halpern, 2014).

Therefore, critical thinking is related to the development of metacognitive understanding which is essential to lead to high levels of cognition (Lockwood, 2003). Thus, a fundamental aspect of critical thinking is the metacognitive activity which brings to reflect on the thinking itself, to evaluate one's own thinking practice and to learn from the same learning experience (Semerci & Elaldi, 2014; Vezzosi, 2004). Further research on metacognitive monitoring and critical thinking might become useful for improving the classroom learning environment.

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