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Teaching How to Think Under Unconscious Process

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ABSTRACT

Studies on the unconscious processes of thinking are reviewed to realize the role of the unconscious in teaching how to think. Thinking refers to a disposition and an aim-focused cognitive process. Cognitive processes need to be monitored for transferring knowledge and explaining thoughts so that the desired influence on both learners and teachers is achieved. Therefore, teaching how aim-focused cognitive processes work and how they affect a cognitive task are considered as distinct educational goals for optimizing the academic performance of both teachers and students. Cognitive processes are emphasized to be mainly unconscious or moderately conscious; however, the unconscious processes have often been abandoned in teaching how to think. This abandon guides to disappointing consequences in obtaining the aim of "teaching how to think". This paper discusses the link between the unconscious thinking processes and teaching how to think, which involve critical and scientific thinking, reasoning, problem solving and decision making.

KEYWORDS: Unconscious processes, Information processing, cognitive process, teaching how to think, Learning processes.

INTRODUCTION

Thinking

Thinking is our incomparable inherent faculty (Freud, 1900) that makes life possible for us by being a unique identity and the essence of humanity. Thinking systematically transform our mental representations of facts to describe possible or actual positions of the world, frequently it serves our goals (Holyoak and Morrison, 2005). Thinking enable us to make use of meaning and to make better choice for guiding our behaviour, to confirm the correct and desired answers to some questions or issues, and to reach a decision (Baumeister, and Bushman, 2008). People want to know why something happened, what the best thing to do is, or what kind of person they are dealing with. Thinking hereby is differentiated into automatic process and controlled one by intention, control, effort, and efficacy.

Mostly, people recourse to thinking when they are not able to go from present situation to desired situation (Holyoak and Morrison, 2005) or when a satisfactory end is achievable (Moseley et al, 2005). The desired ends or seeking satisfactions are mostly being settled in humans' mind, with conscious and unconscious thoughts (Freud, 1915b, 1933; Thompson, 2004). Freud (1900) asserted that thought-processes are in themselves without quality, except for the pleasurable and un-pleasurable excitation which accompanies them, and which in view of their possible disturbing effects upon thinking. The pleasure and un-pleasure excitation are the only psychical qualities apprehended by consciousness (relatively) for a transformation of energy inside the psychic apparatus, other than by the perceptual system that receives external excitations (Freud, 1900, 1911, 1920a; Mijolla, 2005). The transformation of energy is operated by thinking faculties of the mind (Freud, 1900). Thinking faculties of the mind are working over the whole material received by the totality of sensory stimuli arouse in the mind in the first place a number of ideas; the ideas derivative of external and internal stimuli that become linked together and call up a further series of ideas (or images) according to the laws of association(Freud, 1900). By means of laws of association, the restrictions imposed by the reality may be taken or not be taken into account in the thought processes when seeking pleasure and (illusionary) wish-fulfilment (Freud, 1900; 1933, Talvitie and Ihanu, 2005).

Freud (1911a) formulated the mental functioning in two kinds. The first one is logical and realistic (secondary process thinking) and the second one is the ability to displace mental elements (primary process) depended upon hallucinatory capacities (Fordham, 2005). The distinction was taken up by Jung in a rather different way, as directed and undirected thinking: directed thinking was conceived to be a property of consciousness, and the undirected one was designed to express unconscious archetypal contents of the psyche (Fordham, 2005).

Thinking in contemporary aspect is conceived to be a conscious activity of which the thinker is aware (*cogito, ergo sum*); albeit there is not an exact claim that thinking is inherently rational, optimal, desirable, or even smart (Holyoak and Morrison, 2005). According to Bayer (1997) thinking is the mental process by which

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people make sense out of their experiences. The mental process is considered as what transfers an object, fact and event into symbols (Çubukcu, 2006). According to Çubukcu, (2006), thinking as the mental process execute a lot of operations such as calculating, inferring and producing meaning of the upcoming symbols. However, in term of behaviourist approach, thinking refers to weak behaviour (Skinner, 1989), rather than mental representation of objects or facts. For behaviourist such as Skinner (1989), thinking is to do something that makes other behaviour possible; solving a problem is an example of it. Thinking hereby conceived to be performing actions mentally before doing them physically (Baumeister, and Bushman, 2008). In contrary, in term of cognitivist approach, physically performed actions can be understood only by knowing how people perform them mentally (Sternberg, 2003).

The emerged issue is to what extent mentally performed actions are knowable, since distinct kinds of thinking arise in different kinds of task that require people thinking critically and creatively to solve problems, make decisions, and to draw conclusions (Braisby and Gellatly, 2005; Çubukcu, 2006). *Critical thinking* is a form of higher-order thinking as *consciously controlled* reflective thought that is different from lower-order cognitive processes like memory, attention and perception (Smith, 2003). Yet, thinking is not separable from "working memory," that is the system in charge of short-term maintenance and manipulation of information (Holyoak and Morrison, 2005). Hence, conscious high-level critical thinking contains all previous cognitive processes such as reasoning, decision making problem solving and creative thinking (Moseley *et al*., 2005) which are essential for one's intellectual capacity or mental processing of knowledge to reach certain goals (Smith, 2003; Çubukcu, 2006; Zhang, 2006). Certain goals are attainable through construction of actions that deals with problem solving (Holyoak and Morrison, 2005; Zhang, 2006). The constructed actions are assessed by *reasoning* and *decision* making over certain goals or probabilities that yield a certain judgment with selection among options (Braisby and Gellatly, 2005; Çubukcu, 2006. The assessment of certain goals generates a new idea that is conceived as creative thinking (Moseley et al., 2005).

In the light of abovementioned, thinking is explained in terms of precisely specified simple mechanism called *elementary information processes* which are organized by programs into complex processes of thinking and problem solving (Newell and Simon, 1959). Accordingly, thinking is fundamental to computational human information processing by the thought lying at the root of it, that involve transformation of mental representations guided by rules (akin to the computer program) (Braisby and Gellatly, 2005).

Each kind of thinking involves *mental representations.* According to Freud (1915c; Mijolla, 2005) mental representations (thoughts, images, and memories) are unconsciously kept away from consciousness or close to it in regarding to pleasure and un-pleasure content of it. An disagreeable contents of it are kept at a distance from consciousness, and pleasurable/agreeable are kept close to it. Present psychologists have close assertion to Freudian repressed thoughts that human beings tend to repress a thought in two processes (Baumeister, and Bushman, 2008). The one process automatically checks all incoming information that might remind the unwanted thoughts to them. The other one is controller to keep attention away from the unpleasant thoughts (conscious mind quickly turns attention elsewhere).

Westen (1999) reviewed the available evidence in support of unconscious thinking and affectivity, hereby he concluded that "the unconscious processes served many diverse functions, but they should not be grouped under a single heading, *the* unconscious, as if they all do the same thing, serve the same function, or operate on the same principles. . . . *We should instead speak of unconscious processes*".

Unconscious Process in Teaching Thinking

In terms of education, thinking is generally used to mean a consciously goal-directed process, such as remembering, planning in what to say and do, considering opinions, generating new ideas, imagining situations, forming concepts, reasoning, judging, making decisions, and solving problems(Moseley *et al*., 2005). Particularly, thinking and imagination has become a style of learning; because a learner uses coding and decoding system by visual aids unconsciously to remember a proceeded word or an image (Clark and Paivio, 1991, Pavioi, 1991). Accordingly, the coding and decoding system suggests that if the learners can understand how they prefer to think about their learning style and how it affects their work they can optimize their performance (Clark and Paivio, 1991, Pavioi, 1991).

However, there is restricted knowledge on what a student is thinking while learning from instruction (Marland and Edwards, 1986). Thinking is supposed to refers the goal oriented and organized cognitive processes to understand the current situation (Çubukcu, 2006). Therefore, the term thinking refers to the teaching, learning and developing of higher order thinking as a distinct educational goal (intellectual faculties) (Anat, 2004) not just in tem of student but also in terms of teachers because explaining one's thinking to another leads to a deeper cognitive processing (Sullivan, 1998). The educational goal purposes to keep students attentive and actively engaged in the learning process and offers them a more memorable and conscious learning experiences (Borich, 1996). However an obstacle in conscious learning experiences is that there is a shift in the level of information processing and split-attention of the learners that they are sometimes either unable to articulate the reasons for it or unaware of it (Marland and Edwards, 1986). Yet, a bringing of thinking abilities

into play in teaching and learning refers to performing any mental operation, such reasoning, judging, drawing conclusions, choosing, holding an opinion, purposing, musing over, mediating, pondering, reflecting, and weighting a matter mentally (Moore, 2005). Thus, learning is supposed to include the acquisition and the application of information that involves a change or reordering of contents in one's cognitive faculty (Hoare, 2006).

Teaching Thinking

It is considered to be significant for teachers to look at how their students think and act at the base of conscious and unconscious elements of their thinking ability (Thompson, 2004). The underlying factor of thinking, behaviour and activity is asserted to be mostly unconscious or relatively conscious (Freud, 1915b). Because transference or displacement of thoughts, feelings, and behaviour is argued to be the unconscious rather than conscious, that is not only in teaching and learning environment (Robertson, 1999) but also in social learning one (i.e. social modelling behaviour, developing and using implicit-tacit knowledge, and acquiring and evolving an adult identity) (Reber, 1989).

Like most people, students and teacher have a tendency to react according to their perceptions of events that guide their motivation (Moore, 2005). Motivational perspectives on thought and reasoning originated most prominently with Freudian theory of the psychodynamic conflicts created by unconscious drives and urges (Holyoak and Morrison, 2005). Both classic and contemporary perspectives put forth that cognitive processes of people (e.g., their recall, information search, or attributions) directed in ways to reach desired conclusions; the needs of people influence on their thought processes, preferences, and goals that is to reach desired outcomes (or avoid undesired outcomes) (Holyoak and Morrison, 2005). Accordingly thinking is supposed to be an internal, mental process that constructs and operates on mental representations of information (Moseley et al, 2005).

However, genes, environment, and, especially, their interactions are considered to be more important in the perspective of cognitive developmental psychologists by which they explain how and why people think and behave differently or similarly at various times in their lives (Sternberg, 2003). Most of them agree that changes in cognitive development occur as a result of the interaction of maturation (nature) and learning (nurture) (Sternberg, 2003; Çubukcu, 2006). Besides, they stress the notion that people are intrinsically motivated from birth onward to actively explore, understand, and control their environments. Accordingly, understanding transcends the literal information acquired since they impose meaning on their perceptions and form beliefs from their birth onward (Schunk and Zimmerman, 2003). But, one understands is being positively affected and nourished by sophisticated control over her/his own thinking and learning in their personal and social interaction (Teremzini et al, 1995; Sternberg, 2003; Çubukcu, 2006). Besides, they become capable of more complex interactions between thought and behaviours engaged in more thorough information processing with age, as well (Sternberg, 2003; Çubukcu, 2006). This interaction of maturation and learning hereby highlights the concept of "critical thinking", which is one of the important thinking types as the way to perceive world (Çubukcu, 2006).

Critical Thinking

The maturation and learning interaction underlies educational competency that is may be viewed as a cornerstone of students' thinking and learning experiences constructing their *critical thinking* skills (Paul *et al*., 1998). Critical thinking is supposed to be a self-regulating, intellectual process of purposefully analyzing and evaluating all available information in order to formulate a well reasoned conclusion as accurate thinking in search of applicable and reliable information about the world (Paul *et al.*, 2008).

Critical thinking entails the ability to recognize the fallibility of one's own opinions, the probability of bias in those opinions, and the danger of differentially weighting evidence according to personal preferences (Sa *et al*., 1999). Thus, critical thinking becomes about one's own thinking processes (Çubukcu, 2006), that is a kind of meta-cognition for focusing on the real problem or decision to be taken with credibility based on conscious awareness of mental process (Moore, 2005; Lovrek *et al*., 2008). It means, ordinary thinking is usually simple and lacks standards, whereas critical thinking is more complex and it is based upon standards of objectivity and consistency. However, any type of thinking is assumed to be instigated by subjective internal mental process and mental representations of information (Moseley *et al*, 2005). Thus, conscious awareness of one's mental processes is restricted by unconscious mental representation of desirable and undesirable information (Holyoak and Morrison, 2005). Accordingly, Moore, (2005) suggested that student must be taught to accord their thinking from guessing to estimating, from preferring to evaluating, from grouping to classifying, from believing to assuming, from interfering to interfering logically, from associating concept to grasping principle, from noting relationship to noting relationships among relationships, from supposing to hypothesizing, from offering opinions without reasons to offering opinions with reasons, from making judgments without criteria to making judgments with criteria.

As appeared, thinking is purposed to have potentiality for performing aforementioned suggestions through primarily linear and sequential of analytic logical thinking that occupies place at left hemisphere of

brain, which is often perceived as scientific thinking (Goodrum, 1979). The scientific thinking is akin to the rational approach to problem solving. This approach is seen in the majority of all science courses.

Scientific Thinking

When the approach, methods and principles of scientific thinking is being used in everyday life the critical thinking is being practiced, such as when studying history or literature, investigating societies or governments, seeking solutions to problems of economics or philosophy, or just trying to answer personal questions about oneself or the meaning of existence (Paul *et al*., 2008). Respectly, the deep connection between levels of content of knowledge shows that both critical thinking and the scientific thinking process have significant implications for education (Yürümezoğlu and Oğuz, 2007). Therefore, one of the most essential goals of science education is to develop students' scientific thinking skills (Yaman, 2005).

As with any activity, the development of skill at thinking entails the acquisition of considerable amounts of declarative and procedural knowledge (Smith, 2003). Thus, scientific thinking skills activities that have been suggested for students are (Teremzini *et al*, 1995; Moore, 2005):

1) *Inference making*: it requires a rationale for thoughts which are personal beliefs about a situation based on similar associations with past experiences.
2) *Logical thinking:* it requires logical thinking for assumption or concepts and generation ideas step-by-step that arrive at end point or solution. Logical thinking is based on previous knowledge or acquired of patterns of thinking.
3) *Problem solving*: Complex thinking processes often involve problem solving and decision making. Problem solving involves six steps: (1) defining the problem, (2) collecting data, (3) Identifying obstacles to the goal, (4) identifying alternatives, (5) rating alternative, and (6) choosing the best alternative.
4) *Decision making*: it involves the thinking skills needed in choosing the fittest response from several options. It involves examining advantages and disadvantages, considering all of the steps of the problem solving, and evaluating the final decision in relationship to available alternatives and consequences.
5) *Interpretation*: it requires perception in examining the assumptions when making a judgment or reaching a conclusion. Perceptions are developed through associations with personal experiences and are, therefore, unique to each individual.
6) *Analysis:* Examine the problem to be solved, taking a part, identification its element, and finding relationships.

Aforementioned thinking skills activities supposed to have student be good thinkers who realize that their cognitive efforts try to develop mental representations of reality that are complete and accurate in all significant respects (Smith, 2003). Regarding of that, the characteristics of thinking assumed to be as follows (Çubukcu, 2006):

- the masterly and objective use of information;
- stating the organized thoughts in a brief, to the point and objective manner;
- the disposition to differentiate logically valid and invalid results;
- the disposition to understand the belief degrees of thought;
- the disposition to see vague and unclear similarities and difference;
- the disposition to understand the difference of being right and winning a discussion;
- accepting that problems have different ways that lead to the solution, each of which has an internally valid justification;
- understanding the difference between hypothesis, assumptions and results;
- being sensitive towards the difference between the accuracy and strength of a belief;
- the ability to show distinctively different aspects without exaggerating, categorizing or changing.

As appeared, "thinking skills" are demonstrated to be the "basic skills" for learning, on which all other are developed, such as problem solving, decision making, reading, reflecting, making predictions about what might happen" (Moore, 2005). Accordingly, thinking is processing of our experiences in the world; to edit, or rearrange, or examine experiences (Moore, 2005). Thus, the efficiency of thinking can certainly be improved by education so as to make students understood events, solve problems and make decisions by using acquired information about thinking (Çubukcu, 2006). Moreover it contributes development of rational deliberation relevant to a democratic society.

Although aforementioned thinking skills and characteristic of thinking may stronger then conscious processes of learners, the unconscious processes and in addition talent and temperament of learners cannot be ignored, (Thompson, 2004). Indeed, a case can be made that while learners are thinking (with our attention focused on certain elements) they are not aware of the thinking process itself (much of which is unconscious). It is only after the event that they can reflect on the products of their thinking and to a certain extent reconstruct and analyse the process. (Moseley et al, 2005).

Unconscious Process in Thinking and Conscious Learning

Considerations of thinking skills with its characteristics, disposition, approaches, methods and its principles have omitted, the flow of conscious experience (perceiving, thinking, feeling, etc.) is accompanied by a parallel flow of unconscious mentions that never reaches the conscious level; the extent to which it can be regarded as truly unconscious or preconscious (Meissner 2008).

In terms of education, conscious learning appears when one intentionally seeks knowledge or skill development that will expand or change one's database or performance (Hoare, 2006). Arguably, current school (i.e. management, business), efforts are aimed primarily at developing and encouraging students to be reflective and evaluative (critical spirit) rather than teaching the contents of critical-thinking skills (Smith, 2003). It has been argued that teaching processes are not directly to the cause of students' learning, but can give rise to learning by engaging thought processes of students, since it mediates the effects of teaching processes on student learning in class (Marland and Edwards, 1986).

Consequently, as mentioned below, thought process of students point at distinct kinds of thinking arise in different kinds of task that require their reasoning to draw conclusions, solving problem, and making decision critically and creatively (Braisby and Gellatly, 2005; Çubukcu, 2006).

Reasoning

A great deal of human behaviour depends on reasoning processes, but they tend to go unnoticed (Braisby and Gellatly, 2005). By reasoning process people attain a belief which they regard as the result of previous knowledge (Peirce, 1992). Thus, people's reason is understood as mental means of human beings to gain insights, to form judgments, and to act in accordance to those judgments. To prevent inconsistency between reason decision and act, humans should learn thinking and acting in a reasonable manner (Rudolph et al., 2009). A reasonable manner may simply be a by product of a culture and education (Best, 1999).

Reasoning often divided into two types as deductive and inductive for telling whether the conclusion really does follow from the premises (Braisby and Gellatly, 2005). *Inductive reasoning* begins from specific facts or observations to reach a likely general conclusion that may explain the facts (Sternberg, 2003). Thus, by engaging in reasoning people process an applying logical laws for inferring a conclusion from some initial information or premises (Braisby and Gellatly, 2005). Accordingly, the relationship between premises and valid conclusions is the core of characterizing *logical* or *deductive* reasoning that goes from general law to specific fact (Sternberg, 2003; Braisby and Gellatly, 2005). And, by "logical" is being usually meant that individuals are capable of giving plausible reasons for events, or capable of making inferences implied by other factors (Best, 1999), hereby; the truth of the premises guarantees the truth of the conclusion (Braisby and Gellatly, 2005). Accordingly, *logic* is the doctrine of the structure, the forms and the laws of thinking (Rudolph et al., 2009). And the law of thinking underlies human behave or to be rational in two senses. In one sense people are rational if their reasoning conforms to a normative standard like logic (Evans and Over, 1996). In another sense, they are rational when they reason in order to achieve their goals in the world, regardless of whether their reasoning conforms to a normative standard (Evans and Over, 1996). Different mental processes are involved in these forms of reasoning (Braisby and Gellatly, 2005).

To be logical people involves in three simple steps: 1) be observant (notice things, data and events), 2) identify a pattern, and 3) reasoning (give a cause for a phenomenon (Jordaan and Jordaan, 2005). These concepts include cognitive functional skills such as logical thinking, conceptualism with prior knowledge, relationship forming and objective analysis (Jordaan and Jordaan, 2005). In the sense of the skills and application, the ability to reason in a logical manner is so called "formal operations' (Gray *et al*., 1999). The formal operative processes render a learner implement and monitor a current problem by applying and focusing on the reasoning (Ertepinar, 1995; Borich, 1996). Success in formal reasoning seems to depend somewhat on educational level (Best, 1999). In other word, formal reasoning ability has important influence on students' achievement (Ertepinar, 1995). An achievement is assumed to be related to five modes of formal reasoning: controlling variables, proportional reasoning, combinatorial reasoning, probabilistic reasoning, and correlational reasoning (Tobin and Capie, 1981). Mainly, the goal of five mode of reasoning is to draw conclusions deductively from principles and inductively from evidence (Sternberg, 2003).

The five mode of reasoning involve logical thought patterns which may be employed during the process of scientific inquiry that enable individuals to propose relationships between observed phenomena; to design experiments which test hypotheses concerning the proposed relationships; to determine all possible alternatives and outcomes; to consider probabilities of occurrences; to predict logical consequences; to weight evidence, or proof; and to use a number of instances to justify a particular conclusion, so called scientific reasoning (Paul *et al*., 1998). In addition to development scientific reasoning, there has been substantial research on the nature and development *of argumentation, problem solving, decision, judgment* and *planning* that are considered aspects of *thinking*—the deliberate application and coordination of one's inferences to serve one's purposes (Moshman, 2005).

Based on the researches, the development of scientific reasoning is largely a matter of increasing consciousness of and control over theories, evidence, and inferential processes (Moshman, 2005). Thus, the

conscious system alone renders people to perform complex logical reasoning, although people consciously have only one thought at one time (Baumeister and Bushman, 2008).

Conscious thoughts and ideas are proposed to be linked together in a logical fashion (Arkes and Garske, 1982). Logical fashin refers to the formal structures determining a coherent order in a sequence of ideas (Mijolla, 2005). However, people may possess automatic unconscious reasoning mechanisms that operate in accordance with probabilistic standards of reasoning (Stanovich andWest, 1998). Furthermore, unconscious assumed to be timeless (Freud, 1915b) that means the unconscious is free to undergo transformation in which they become illogical, condensed, or displaced. Therefore, Freud called the illogical, drive-laden style of cognition of the unconscious primary-process thinking and the logical, drive-free style of cognition of the conscious secondary-process thinking (Arkes and Garske, 1982).

As the logical, thinking grows out of the human experience, so instinct and sentiment development in human beings from inner and outer experiences, and that takes place in a slow and deep process which brings out mental energy and vitality hence, *instinct and sentiment are* as the real substance of the human mind (Peirce,1992). Moreover, psychologist assumed that humans' mind have limited ability for explicit logical reasoning; however, they have higher limit faculty for implicit reasoning that is independent of logical processes (Evans and Over, 1996).

Problem Solving

Problem-solving became an approach in learning that includes cognitive functional skills such as that students understand related concepts (conceptualism) logically (logical thinking), by linking between previous knowledge and targeted knowledge in learning processes (Jordaan and Jordaan, 2005; Holyoak and Morrison, 2005; Yaman, 2005). Thus, students are located at the current knowledge state at which as solver at any given point in the solution process (Holyoak and Morrison, 2005). In view of that, students are considered as being the canter of learning, covering real life experiences, applying cooperative studies, using problem solving, developing communication skills and promoting logical thinking (Yaman, 2005).

"A problem exists" when a solver has a goal, but the solver doesn't know how this goal is to be reached (Sternberg, 2003; Braisby and Gellatly, 2005; Holyoak and Morrison, 2005). Nevertheless, the solver must find a means for arriving at it (Best, 1999). In order to arrive from a given situation to a desired situation the solver has recourse to think **(**Holyoak and Morrison 2005). If there are no obstacles preventing the solver moving from the current state to the desired state then, there cannot be said to be a problem (Braisby and Gellatly, 2005).

Accordingly, the solvers necessarily begin to solve a problem with the recognition that a problem exists (thinking stage of preparation) (Best, 1999). In order to recognize, the solver must perceive a discrepancy between the current state and some desired state of affairs so that undertake mental processes (Sullivan1999) with the intention of achieving the goal (Best, 1999). If the solver failed to achieve the goal, she/he may then put the problem at some unconscious level, thought and work process (thinking stage of incubation**)** (Best, 1999). Putting problem at some unconscious level supposed to be under the flash of insight strategy that ends the unconscious work and brings the answer to the survey of consciousness (thinking stage of illumination) (Best, 1999). As a result, the solver confirms the insight, checking to make sure that the insight worked (thinking stage of verification). Therefore, a problem proposed to be consisted of three components: a starting state, a goal state and a set of available actions or operator to move from one state to the next until the goal is achieved (Skinner, 1989; Braisby and Gellatly, 2005). Hence, a problem primarily necessitates awareness is necessary for intention (Jack and Shallice, 2001).

More precisely, a convinced general problem solving models for explaining problem solving processes deals with several descriptions which are (Kirkley, 2003; Sternberg 2003; Holyoak and Morrison,2005): (a) identification the problem, (b) definition the problem through thinking about it and sorting out the relevant information, (c) exploration the solutions through looking at alternatives, brainstorming, and checking out different points of view, (d) acting on the strategies, and (e) looking back and evaluate the effects of own activity. However, recently, it is evident that problem solving includes a complex set of cognitive inference from behaviour that leads to solution, and attitudinal components that involves manipulation of or operations on previous knowledge (Kirkley, 2003). So, problem solving was defined as a multiple step process where the problem solver must find relationships between past experiences (schema) and the problem at hand and then act upon a solution (Kirkley, 2003; Holyoak and Morrison,2005)**.** Therefore, solving a problem entails learning how to apply a set of rules towards reaching a goal (Zanga et al, 2004). Holyoak and Morrison (2005) hereby outlined that it is important to distinguish the solver's representation of the problem (i.e., the solver's understanding of the underlying nature of the problem) and the sequence of steps the solver takes to get from the given situation to the goal.

The occupying role of the solver's representation of a problem shows that problem solving is typically viewed as mental processes that individually constructed by the process of interpretation of experiences in a particular context (Sullivan, 1998). However, mental process is also viewed as cognitive structures that working independent of personal experiences (Sternber, 2003). Nisbett and Wilson, (1977) stated that people are mostly

unaware of cognitive processes and sometimes they are unaware of the existence of a stimulus that influenced their response; moreover, they are unaware of all the responses they have made, either; even if they are aware of the stimulus in question, they are unaware that they have been influenced by it. This hereby, indicates that humans have little access to higher mental processes (Nisbett and Wilson, 1977; Lewicki *et al*., 1992; Loftus and Klinger, 1992; Churchland, 1995; Best, 1999; Sternberg, 2003; Gilhooley, 2008).

As appeared, consciousness is restricted to both either to mental processes (Freud, 1915b) or to cognitive structures and operations (Nisbet and Wilson, 1977). In term of cognitive processes the limit of working memory prohibit to use more than just a few possible operations at one time to solve a problem (Sternberg, 2003). Because of this, limitation of the mental shortcuts must be used for solving problems (Newell and Simon, 1959). These mental shortcuts are termed *heuristic* that is informal, intuitive, speculative strategies, and sometimes lead to an effective solution (Smith, 2003) and sometimes do not (Holyoak and Morrision, 2005). Application a heuristic to a variety of problem can lessen the burden on limited-capacity of working memory (Sternberg, 2003). Hereby, cognitive psychologists have attempted to explain meaning making with heuristic (and schemata) as the representation in the memory (Sullivan, 1998).

However, “mental representation” are emerged as the intervening issue, Freud (1915c) asserted that it works according to pleasure and unpleasure principle, that ignore consciousness. Respecting to Freud (1915c), the following contents of problem solving are supposed to be based on the unconscious processes, since problem solving include higher order thinking skills such as "visualization (Pavio, 1991), association, abstraction, comprehension, manipulation, reasoning, analysis, synthesis and generalization which are require to be 'managed' and 'coordinated (Garofalo and Lester 1985). Particularly, these higher order thinking skills are emphasized in educational objectives (Kirkley, 2003). However, problem solving with high order thinking skills has been considered to begin with a problem representation, and the representation as a manipulation of a ‘simple’ problem may make the problems extremely difficult to solve (Braisby and Gellatly, 2005). Furthermore, the information processing approach also analyses problem solving in terms of search within the space of possibilities arising from a particular way of representing the problem (Braisby and Gellatly, 2005).

As appeared above, skills in problem solving involve more than just the accumulation of knowledge (Braisby and Gellatly, 2005). A problem which has not clear solution necessitate a restructure of representation of problem to be solved (Sternberg, 2003). However, the representation seems to be at the core of the paradox in what we often fail to see the crucial relationships between a current problem, and one we have previously encountered (Braisby and Gellatly, 2005). In other words, a proper or widely acceptable restructure process of representation of a problem is controversial; nevertheless, a proposed strategy is ‘insight” (Best, 1999; Sternberg, 2003) as aforementioned which is sudden and which is the result of much prior thought and hard work to understand a problem (Sternberg, 2003). Gestalt psychologist described examples of insight and speculated on a few ways in which the special process of insight might occur from (Sternberg, 2003): (a) extended unconscious leaps in thinking, (b) greatly accelerated mental processing, or (c) some kind of short-circuiting of normal reasoning process. Thus, insight is to find a solution to a problem by trying to from a different perspective, because thinking is much like perceiving (Best, 1999).

Thus, the representation seems to be backbone of the problem solving with the crucial relationships between a current problem and one we have previously encountered (Braisby and Gellatly, 2005). However, a proper or widely acceptable restructure process of representation of a problem is controversial (Best, 1999; Sternberg, 2003). Hence, unfortunately, directly teaching a problem solving process doesn’t improve actual problem-solving performance (Kirkley, 2003).

Decision Making

Plainly, making decisions is one of the constant and fundamental cognitive processes for human’s behaviours and activities (Atkinson and Shiffrin, 1971; Braisby and Gellatly, 2005; Wang and Ruhe, 2007). Humans integrate a body of information in a meaningful way for proper decision, namely, they recourse to faculty of “thinking” (Dijksterhuis 2004a). In many situations where human must make a choice, they will be uncertain about whether the possible outcomes will turn out to be good or not so good; after all, risk is an inescapable fact of life (Braisby and Gellatly, 2005).

For the purpose of a choice or selection, decision making involve rules, strategies or certain criteria that enable the humans to choose between several possible courses of action, or several possible responses (Atkinson and Shiffrin, 1971; Wang and Ruhe, 2007. Thus, decision-making starts with identifying and clarifying the problem or opportunity as far as one is concerned (Thompson, 2004). Hence, decision making are widely used (as a taxonomy of strategies corresponding criteria for decision making) in determining rational, heuristic, empirical and intuitive selections in almost each procedure of daily life, and it occurs every few seconds in the thinking courses of human mind consciously or unconsciously (Wang and Ruhe, 2007). However, the evidences are lacking which indicate the effectiveness for a making decision in daily life (Lewicki, 1985).

Accordingly, a variety of research has been carried out to discover which factors effective in decision making. The considered factors are proposed to be cognitive, affective, emotional, social and individual factors

in decision making (Sarı, 2008). Along with these dimensions, cognitive-behavioural models of decision making point out that the factors such as self awareness, self-regulation, problem solving, motivation influence decision making (Sarı, 2008).

Constructivist asserts that people usually make the correct attribution regarding their visual sensations because they perform unconscious inference, the process by which we unconsciously assimilate information from a number of sources to create a perception (Sternberg, 2003; Bargh and Morsella, 2008). In other words, using more than one source of information, we make judgments-what underlie decisions- (Braisby and Gellatly, 2005) that we are not even aware of making it (Sternberg, 2003; Bargh and Morsella, 2008). According to social psychologist, social information processes are also quick and often without conscious decisions (Nigoff, 2008). Along with this dimension, Wang and Ruhe (2007) assigned that the cognitive process of decision making may be informally described by the following courses:

a) To comprehend the decision making problem and to identify the decision goal in terms of 'object' and its 'attributes'
b) To search in the abstract layer of long term memory for alternative solutions and 'criteria' for useful decision strategies
c) To quantify set criteria and determine if the search should be go on.
d) To build a set of decisions by using and criteria as obtained in previous searches.
e) To select the preferred decisions on the basis of satisfaction of decision makers.
f) To represent the decisions in a new 'sub-object-attribute-relation' model.
g) To memorize the sub-object-attribute-relation model in long term memory.

According to Epstein (1998), as another perspective of cognitive processes of making decision, people rely on two systems in making decision; the rational system (that adept at drawing meaning from abstract numbers, words, and symbols) and the experiential system (instead responding to concrete images, metaphors, and narratives). Through prior experiences (experiential system), people rapidly analyze situations, because their mental models contain knowledge derived from past personal interactions with the world (Anderson, 1983). Through the rational system, people may be effective to making decisions between relatively simple options (Brown and Oakley, 1998). Dijksterhuis and Olden (2006) suggested that when an individual makes decision between simple task she/he relies on conscious thought (engaging the rational system), whereas, between complex tasks she/he should turn out the rational system and rely on unconscious thought (engaging the experiential system), because unconscious thought works better on complex decision. Even in the apparently most rational decision-making processes, there are irrational procedural modules at work whose existence we are unaware of, but which influence outcomes (Jervis, 2007)

Psychologists purposed that humans are not entirely and boundless rational in making decisions, but within limits humans are rational (Sternberg, 2003). Indeed, debating whether or not people are essentially rational or irrational decision makers has long been a preoccupation of researchers in this field, just as the rationality of thought has been a key concern for researchers studying human reasoning (Braisby and Gellatly, 2005). Notwithstanding, there is general agreement that rational choices should satisfy some elementary requirements of consistency and coherence (Tversky and Kahneman, 1981). However, humans are not entirely capable of considering all possible options and then carefully compute which of time universe of options will maximize gains and minimize losses (Sternberg, 2003).

In several studies on decision making people were given the opportunity to think about choices, and it exhibited that who thought unconsciously made superior decisions relative to those who thought consciously or who did not think at all (Dijksterhuis *et al*., 2006; Dijksterhuis and Olden, 2006). Furthermore, only a limited number of choices have been based on conscious information processing strategies (Dijksterhuis *et al*., 2005). In other words, conscious thinkers have recalled less information overall than unconscious thinkers (Dijksterhuis and Nordgren, 2006). In contrary, unconscious could integrate large amounts of information (Dijksterhuis, 2004a). Regarding to these studies it was asserted that people often choose unconsciously or at least almost unconsciously (Dijksterhuis *et al*., 2005). Besides, unconscious thinkers consistently could make the best decisions as judged from a normative perspective (Dijksterhuis and Teun, 2006).

Decision making theorists have long recognized that decision makers have to deal with limited capacity of consciousness (working memory) (Tversky and Kahneman, 1981; Dijksterhuis, 2004a; Dijksterhuis and Nordgren, 2006; Dijksterhuis *et al*., 2006). It has explicitly been argued that the low capacity of consciousness can lead to poor decisions or choices and leads to be to be maladaptive in making complex decisions (Dijksterhuis , 2004a; Dijksterhuis et al., 2005; Dijksterhuis *et al*., 2006; Dijksterhuis and Nordgren, 2006; Dijksterhuis and Olden, 2006; Bos et al, 2008). In effect, conscious thought is good when things are simple (Dijksterhuis and Nordgren, 2006). Conversely, people can improve and be highly effective decision or choices after engaging in unconscious thought rather than in conscious thought (Dijksterhuis, 2004a; Dijksterhuis *et al*., 2006; Dijksterhuis and Olden, 2006; Bos et al, 2008). Accordingly, the studies have argued that the capacity of consciousness and conscious thought is not necessary to make good decisions under very complex

circumstances (Dijksterhuis and Nordgren, 2006). Notwithstanding, as long as conscious capacity is enough to deal with a particular problem, it is likely to be a good thinker at making decision (Dijksterhuis 2004a).

Still, the evidences are lacking that indicate of better support for a making decision in daily life, because the memory "representation" of even a single instance relevant in some respect to the present situation is capable of influencing the final decision (Lewicki, 1985).

Summary

Thinking is a disposition and an aim-focused cognitive process that can be taught directly; moreover it contributes development of rational deliberation relevant to a democratic society, and it's efficiency can certainly be improved by education so as to makes students understood events, efficient in solve problems and make efficient at their decisions by using acquired information on how thinking works (Çubukcu, 2006).

The term thinking refers to the development of higher order thinking as a distinct educational goal (Anat, 2004) not just in term of student but also in term of teacher because explaining one's thinking to another leads to deeper cognitive processing.

It has been appeared to be significant that when we consider students we have to look at how they think as well as at how they act, at the base of conscious and unconscious elements of thinking process (Thompson, 2004). Transferring knowledge to each other is argued to be an unconscious rather than conscious displacement of thoughts, feelings, and behaviours from a previous significant relationship onto a current relationship—a phenomenon that teachers and students both enact with each other — (Robertson, 1999). In term of social learning the transference largely occurs unconsciously (i.e. social modelling behaviour, developing and using implicit (tacit) knowledge, and acquiring and evolving an adult identity) (Reber, 1989). Accordingly, what the underlying factors of thinking and behaviours are asserted to be mostly unconscious or relatively conscious. Thus, it has been suggested that if the learners can understand how thinking process work and how it affects on their task they can optimize their performance.

The description of thinking skills (the characteristics, disposition, approaches, methods and the principles) has neglected that the flow of conscious experience (perceiving, thinking, feeling, etc.) is accompanied by a parallel flow of unconscious mention that never reaches the conscious level; the extent to which it can be regarded as truly unconscious or preconscious (Meissner 2008).

REFERENCES

Anat, Z. (2004). Elements of Teachers' Pedagogical Knowledge Regarding Instruction of Higher Order Thinking. *Journal of Science Teacher Education,* 15(4): 293-312. Netherlands. Kluwer Academic.

Arkes, H.R., and Garske J.P. (1982). *Psychological Theories of Motivation*. (2nd ed.) U.S.A. Brooks/Cole.

Atkinson, R. C. and Shiffrin, R. M. (1971). The Control Processes of Short-Term Memory. *Technical Report-Psychology Series, 173.* Institute for Mathematical Studies in the Social Sciences, Stanford University, California.

Baumeister, R.F., & Bushman, B.J. (2008). *Social Psychology and Human Nature.* (International student Edition). U.S.A: Thomson Wadsworth.

Best, J.B. (1999). *Cognitive Psychology*. (5th ed.) U.S.A. Wadsworth.

Borich, G.D. (1996). Effective Teaching Methods. (3rd ed.) USA. A Simon & Schuster. Prentice-Hall.

Braisby, N., & Gellatly, A. (2005). Cognitive Psychology. New York. Oxford University.

Brann, E.T.H. (1991). The World of Imagination Sum and Substance. Landham, Rowman & Littlefield Publishers Inc, Maryland.

Churchland, P.M. (1995). The Engine of Reason, the Seat of the Soul: A Philosophical Journey into the Brain, ISBN 0-262-03224-4, MIT Press, Cambridge, MA.

Clark, J. M., & Paivio, A. (1991). Dual coding theory and education. Educational Psychology Review, 71, 64-73.

Clark. A.J. (1991). The Identification and Modification of Defense Mechanisms in Counseling. *Journal of Counseling & Development*, 69.

Çubukcu, Z. (2006). Critical Thinking Dispositions of the Turkish Teacher Candidates. *The Turkish Online Journal of Educational Technology*, 5 (4).

Dijksterhuis, A. (2004a). Think Different: The Merits of Unconscious Thought in Preference development and Decision Making. *Journal of Personality and Social Psychology,* 87(5): 586–598. American Psychological Association,

Dijksterhuis, A., & Nordgren L.F. (2006). A Theory of Unconscious Thought. Perspectives on Psychological Science, 1(2). Association for Psychological Science.

Dijksterhuis, A., Smith, P.K., Rick, B., Baaren, V., & Wigboldus, D.H.J. (2005). The Unconscious Consumer: Effects of Environment on Consumer Behavior. Journal of Consumer Psychology, 15(3), 193-202. Lawrence Erlbaum Associates.

Dijksterhuis, A. (2004b). I Like Myself but I Don't Know Why: Enhancing Implicit Self-Esteem by Subliminal Evaluative Conditioning. *Journal of Personality and Social Psychology,* 86(2):345–355. American Psychological Association.

Dijksterhuis, A. and Smith P.K. (2002). Affective Habituation: Subliminal Exposure to Extreme Stimuli Decreases Their Extremity. *Emotion*, 2(3): 203–214. American Psychological Association.

Ertepinar, H. (1995). The Relationship between Formal Reasoning Ability, Computer Assisted Instruction, And Chemistry Achievement. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi* 11: 21-24.

Evans, D. And Over (1996). *An Introductory Dictionary of Lacanian Psychoanalysis*. New York, USA. Routledge. Taylor & Francis e-Library.

Fordham, M. (2005). Neumann and childhood. Journal of Analytical Psychology, 26(2). In Hobdell, R. (1981). *Freud, Jung, Klein-the fenceless field: Essays on psychoanalysis and analytical psychology*, (pp. 132-149). USA. Taylor & Francis e-Library.

Freud, S. (1900). The Interpretation of Dream. In Strachey, J. (Ed.), (1964). *The Standard Edition of the Complete Psychological Works of Sigmund Freud, (1893-1940):*London, The Hogarth Press and the Institute of Psycho-analysis.

Freud, S. (1911). *The Interpretation of Dreams*. (3th ed.)Vienna, Austria. Dr Brill.

Freud, S. (1915b). The Unconscious. In Strachey, J. (Ed.). (1964). *The Standard Edition of the Complete Psychological Works of Sigmund Freud (1893-1940):* London, The Hogarth Press and the Institute of Psycho-analysis.

Goodrum, D. (1979). Creative and Logical Thinking in Adolescents. *Research in Science Education*, 9: 177-182.

Gray, E., Pinto, M., Pitta, D., and Tall, D. (1999). Knowledge Construction and Diverging Thinking in Elementary and Advanced Mathematics. *Educational Studies in Mathematics* 38: 111–133. Netherlands. Kluwer Academic.

Hoare, C. (2006). Handbook of Adult Development and Learning. New York Oxford University Press.

Holyoak, K.J., and Morrison, R.G. (Ed). (2005). *The Cambridge Handbook of Thinking and Reasoning*. Cambridge. Cambridge University.

Jervis, G. (2007). The Unconscious. In Marraffa,M., Caro, M. D and Ferretti, F. (Eds.). Review, Levy, N., Ph.D. Cartographies of the Mind, Philosophy and Psychology in Intersection, 11(22), 147–158. Springer.

Jordaan, A., and Jordaan, D. (2005). A logical and structural thinking development tool (LST) to enhance fundamental problem-solving skills of learners of information technology. *The Journal for Transdisciplinary Research in Southern Africa*, 1(1): 59-76.

Kirkley, K. (2003). Principles for Teaching Problem Solving. Technical Paper, 4. Plato Learning

Lewicki, P. (1985). Nonconscious biasing effects of single instances on subsequent judgments. Journal of Personality and Social Psychology, 48, 563-574.

Lovrek, R.J. Howlett and Jain, L.C. (Eds.) (2008). *KES* , Part III, LNAI 5179, pp. 580–587.

Marland, P.W., and Edwards, J. (1986). Students' in-class thinking. *Instructional Science,* 15:75-88. Netherlands. Martinus Nijhoff Publishers, Dordrecht.

Meissner, W.W. (2008). Mind-brain and consciousness in psychoanalysis. *Bulletin of the Menninger Clinic*, 72(4), 283-312.

Mijolla, A. D. (Ed). (2005). *International Dictionary of Psychoanalysis*. (Vol., I, II, III). New York, U.S.A. Thomson Gale.

Moore, K.D. (2005). *Instructional Strategies: from theory to practice*. U.S.A. Sage.

Moseley, D., Baumfield, V., Elliott, J., Gregson, M., Higgins, S., Miller, J., and Newton, D. (2005). *Frameworks for Thinking: A Handbook for Teaching and Learning*. (1st ed.). New York, U.S.A. Cambridge University Press.

Moshman, D. (2005). *Adolescent Psychological Development: Rationality, Morality and Identity*. (2nd ed). New Jersey. Lawrence Erlbaum Associates.

Newell, A., and Simon, H.A. (1959). *The stimulation of human thought. Mathematic Division*: RAND Corporation. P-1732 .California.

Nigoff, A. (2008). Social Information Processing and Aggression in Understanding School Violence: An Application of Crick and Dodge's Model. In Miller. T.W. (ed.), *School Violence and Primary Prevention*. (pg 79-93). New York. Springer.

Nisbett, R., and Wilson, T. (1977). Telling more than we can know: Verbal reports on mental processes. *Psychological Review*, 84: 231-259.

Paul, A., Klaczynski, J.M., Fauth., and Swanger, A. (1998). Adolescent Identity: Rational vs. Experiential Processing, Formal Operations, and Critical Thinking Beliefs. *Journal of Youth and Adolescence*, 27(2).

Pavio, A., (1991). Dual -coding theory: retrospect and current status. *Canadian Journals of Psychology*, 45: 255-287. Reber, A.S. (1989). Implicit learning and tacit knowledge. *Journal of Experimental Psychology: General*, 118(3): 219–235.

Robertson, D.L. (1999). Unconscious Displacements in College Teacher and Student Relationships: Conceptualizing, Identifying, and Managing Transference. *Innovative Higher Education*, 23(3). Spring.

Rudolph, S., Dau, F., and Kuznetsov, S.O. (Eds.). (2009). *ICCS*, LNAI 5662:66–85.

Sa, W.C., West, R.F., and Stanovich, K.E. (1999). The Domain Specificity and Generality of Belief Bias: Searching for a Generalizable Critical Thinking Skill. *Journal of Educational Psychology*, 91(3):497-510.

Sarı, E., (2008). The Relations between Decision Making in Social Relationship and Decision Making Styles. *World Applied Sciences Journal*, 3 (3): 369-381.

Schunk, D.H., and Zimmerman, B.J. (2003). Self-Regulation and Learning. In Weiner. I.B. (Ed.chi), and Reynolds, W.M., Miller, G.M. (Vol.7). *Handbook of Psychology: Educational Psychology.* New Jersey. John Wiley & Sons.

Skinner, B.F. (1989). *Science and Human Behavior.* New York: The Free Press.

Smith, G.F. (2003). Beyond Critical Thinking And Decision Making: Teaching Business Students How To Think. *Journal of Management Education*, 27(1):24. ABI/INFORM Global.

Stanovich, K.E., and West, R.F. (2007). Natural my-side bias is independent of cognitive ability. *Thinking & Reasoning,* 13(3):225-247. Taylor & Francis Group.

Sternberg, R. J. (2003). *Cognitive Psychology*. (3rd ed.) U.S.A. Thomson & Wadsworth.

Taylor, P. (1981). Imagination and Information. *Philosophy and Phenomenological Research*, 42, 205-223.

Sullivan, P.A. (1998). Social constructivist perspectives on teaching and learning. *Annual Review of Psychology*, 49, 345.

Teremzini, P.T., Springer, L., Pascarella, E.T., and Nora, A. (1995). Influences Affecting the Development of Students' Critical Thinking Skills. *Research in Higher Education*, 36(1).

Thompson, J.L. (2004). Innovation through people. *Management Decision*, 42(9): 1082-1094.

Tobin, K.G., and Capie, W.(1981). The Development and Validation of a Group Test of Logical Thinking. *Educational and Psychological Measurement*; 41: 413.

Tversky, T., and Kahneman, D. (1981). The Framing of Decisions and the Psychology of Choice. *Science,* New Series, 211(4481): 453-458.

Wang, Y., and Ruhe, G. (2007). The Cognitive Process of Decision Making. *International Journal of Cognitive Informatics and Natural Intelligence*, 1(2), IGI Global.

Westen, D. (1999). The scientific status of unconscious processes: is Freud really dead? *Journal of the American Psychoanalytic Association*. 47: 1061-1106.

Yaman, S. (2005). Effectiveness on Development of Logical Thinking Skills of Problem Based Learning Skills in Science Teaching. *Journal of Turkish Science Education,* 2(1).

Yürümezoğlu, K., and Oğuz, A. (2007). How Close Student Teachers' Educational Philosophies and Their Scientific Thinking Processes in Science Education. *Actualité de la Recherche en Education et en Formation*, p.17 Strasbourg. France.

Zanga, A., Richard, J.F., and Tijus, C. (2004). Implicit learning in rule induction and problem solving. *Thinking & Reasoning*, 10(1): 55-83