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Recommended Citation

Taylor, Edward W. (1997). "Implicit memory and transformative learning theory: Unconscious cognition.," *Adult Education Research Conference*. <https://newprairiepress.org/aerc/1997/papers/45>

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Implicit memory and transformative learning theory: Unconscious cognition.

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Abstract: Recent research has found that the transformation of meaning structures (schemes and perspectives) can occur without critical reflection. This phenomenon seems to be explained by a concept called implicit memory-the unconscious development of thoughts and actions. This paper involves a review of related literature on implicit memory from the fields of neurobiology and psychology and its implications for the theory and practice of transformative learning.

Introduction. There has been a notable increase in research over the past decade in the area of memory. This advancement has been fueled by both the field of psychology (the study of cognition, information processing) (Johnson & Hasher 1987; Kihlstrom, 1987; Roediger, 1990) and neurobiology (involving the anatomy, physiology, and pathology of the nervous system) (Schacter, 1996; Squire, 1987). One area in particular that has received considerable attention is the study of implicit memory-unconscious cognitive processing of past experiences that influence our thoughts, perceptions, and actions. This research comes at an opportune time in the ongoing study and debate of Mezirow's transformative learning theory. Recently a review of related empirical studies in the field of adult education found that for some participants a perspective transformation was not dependent upon critical reflection (Taylor, In press). Meaning structures seem to be altered on an unconscious level outside the awareness of the individual, without a deliberate rational examination of assumptions on which the structures were based via introspection or by discourse with others of differing viewpoints. Despite the significance of these studies on transformative learning, their methods are limited in providing an in-depth explanation of a transformation outside the focal awareness of the participant and the related implications. Recent studies involving implicit memory reveal that a great deal of learning (information processing) takes place outside our working memory, on an unconscious level, and it has a tremendous influence on how we look at the world (Greenwald & Banaji, 1995; Roediger, 1990; Schacter, 1996; Schacter, Chiu, & Ochsner, 1993; Schacter, 1992; Squire, Knowlton, & Musen, 1993). Furthermore, since much of implicit memory is inaccessible by introspective methods this also has significant implications for the role of critical reflection in the fostering of transformative learning. Therefore the purposes of this paper are twofold: 1) to describe the nature of implicit memory based on a review of the contemporary research in psychology and neurobiology and how it contributes to the understanding of transformative learning, and 2) to explore the implications that implicit memory has for critical reflection and the fostering of transformative learning.

Transformative Learning. Since 1978 the theory of transformative learning, as defined by Jack Mezirow from his study of women returning to school, has stimulated much discussion in the field of adult education. Transformative learning is "defined as the social process of construing and appropriating a new or revised interpretation of the meaning of one's experience as a guide to action" (Mezirow, 1994, p. 222-223). The process of making meaning is shaped and circumscribed by meaning structures. It is the revision of meaning structures from experiences that is addressed by the theory of perspective transformation. Seen as essential to transformative learning is critical reflection. Critical reflection is the conscious and explicit reassessment of the consequence and origin of our meaning structures (our orientation to perceiving, knowing, believing, feeling, and acting). It "is a process by which we attempt to justify our beliefs, either by rationally examining assumptions, often in response to intuitively becoming aware that something is wrong with the result of our thought, or challenging its validity through discourse with others of differing viewpoints and arriving at the best informed judgment" (Mezirow, 1995, p. 46). However, recent studies (Hunter, 1980; Taylor, 1994) on transformative learning have shown, some participants who experienced a perspective transformation responded to the initiating disorienting dilemma with little or no questioning of their values and assumptions. Instead of critically reflecting on their experience, they seem to respond with unmediated perception, trusting their reaction of direct apprehension and sensory understanding such that the transformation took place on an unconscious and implicit level. Taylor (1994) found in a study on the learning process of intercultural competency that some participants showed little conscious connection between the cultural disequilibrium, possible learning strategies, and their change towards competency. They seem to prefer, instead of critical reflection, thoughtful action and an experiential learning approach to intercultural challenges, with little questioning of the validity of presuppositions of prior learning experiences from their primary culture. One possible explanation for this transformation without reflection lies within the study of implicit memory. Mezirow (1991) in his writing about transformative learning theory recognized the importance of implicit memory as integral in the interpretation and making of meaning of an experience, but does not give it the attention it deserves in influencing change in meaning structures (schemes and perspectives). An explanation of this unconscious change in meaning structures may lie in the research on implicit memory.

Memory: Explicit and Implicit. In psychology the classical model of human cognition saw consciousness as a higher mental processes made up of explicit memory (declarative). Consciousness was the cognitive staging area that holds memories, precepts, actions for attention and rehearsal. On the other hand nonconscious mental life, implicit memory (nondeclarative), was seen as only involving latent memory traces and early preattentive processes (feature detection and pattern recognition) and was having little influence on conscious experience, thought, and action. In the classical model the unconscious was indicative of products of the perceptual system that were unrehearsed, memories lost from short-term memory, due to a lack of processing or decay before they were stored in long-term memory. There was little or no appreciation for the significance of implicit memory in its influence on consciousness (Squire, Knowlton, & Musen, 1993).

Recent research in long-term memory has changed this classical view of implicit memory. Our understanding has moved from a rather monolithic view of long-term memory, to one that is less hierarchical, involving several different kinds of memory systems, each playing a significant role in defining who we are as a person (Squire, Knowlton, Musen, 1993). One system is explicit (declarative) and conscious, involving the limbic and neocortex parts of the brain. This form of memory is also more sensitive and prone to interference, but it is also invaluable, providing the ability for personal autobiography and cultural evolution (Johnson & Hasher, 1987). A second system, which is the focus of this paper, is implicit (nondeclarative) which involves the unconscious development of thoughts and actions. Implicit memory can be received, stored, and recovered without the participation of the limbic system and outside the conscious awareness of the individual. These memories seem to be long term, consistent and reliable, providing an array of nonconscious ways to respond to the world. From implicit memory emerge habits, attitudes, and preferences inaccessible to conscious recollection but these are nonetheless shaped by former events, influence our present behavior, and are an essential part of who we are (Roediger, 1990).

Forms of Implicit Memory. Research in the area of psychology and brain pathology, particularly working with amnesic patients, has begun to identify several forms of implicit memory (nondeclarative) dependent upon a variety of neurological systems (Roediger, 1993; Schacter, 1996; Squire, Knowlton, Musen, 1993). These tentative forms involve the learning of procedural and category-level knowledge, conditioning, and priming. Procedural knowledge are skills and habits, inclusive of perceptual and cognitive abilities, which research has shown can be learned and improved upon outside one's focal awareness. Existing neural evidence suggest that skills and habit learning are different from declarative memory. Research with Parkinson patients who had a brain pathology of the corticostriatal system (projections from the neocortex to the caudate and putamen) were found to be impaired on noncognitive skill task, but demonstrated little difficulty with the declarative memory task of recall and recognition. "These differential effects have been interpreted in terms of two qualitatively different memory systems, a system that supports cognitive (or declarative memory) and a second system, involving the caudate and putamen, that supports noncognitive habit memory" (Squire, Knowlton, Musen, 1993, p. 476).

A second form of implicit memory is category-level knowledge, which is the ability to classify information based on natural categories (e.g., plants and animals) and the implicit acquisition of rules often found in grammar. Grammar is a particularly a good example of implicit memory, where people have acquired abstract rules, but are unable to articulate what guides their speech and writing. This category knowledge has also been shown to operate independently of declarative memory (explicit) and may be another indicator of a separate brain system involving implicit memory (Squire, Knowlton, Musen, 1993).

A third form is conditioning, which involves learning a simple conditioned response, best understood in relation to emotions such as fear, where people's actions in dangerous situations are often based on nondeclarative thought. Also research with amnesic patients, found participants exhibited progressive learning and 24 hr retention of a conditioned eyeblink response, despite inability to describe the apparatus or what it had been used for (Squire,

Knowlton, Musen, 1993). This means that conscious awareness of certain knowledge is not necessary for conditioning to occur and learning can take place on an implicit level. Also particular brain structures have been found to be essential for conditioning such as the cerebellum for the skeletal musculature and the amygdala for emotions.

The fourth form and the most researched memory phenomenon in amnesia in relation to implicit memory is priming (Schacter, 1992; 1996; Schacter, Chiu, & Ochsner, 1993; Squire, Knowlton, Musen, 1993). Priming is the "facilitated ability to identify, or make judgments about, target stimuli as a consequence of a recent exposure to them" (Schacter, 1992, p. 11113). In essence, amnesic patients could be influenced by recent experiences that they failed to recall consciously. A typical experiment involves a list of words, pictures, or novel objects which are viewed by the research participants. Following this initial review participants are tested again after a predetermined period of time with both new and old items. They are asked to name words or objects, to produce words from fragments or make quick decisions about new and old items. Findings reveal that participants response is better for old than new items. Priming betters the fluency and speed by which an individual responds to a familiar stimuli (Squire, Knowlton, Musen, 1993). Research with amnesic patients has shown priming to be fully intact, as measured by word stem completion and perceptual identification (Schacter, 1993). Each of these forms of implicit memory begins to create a picture of learning that not only operates as a separate system in the brain, but also has a tremendous influence over our thoughts and actions. Furthermore it operates outside our conscious awareness and ability to reflect, and has the potential to contribute to a transformation of meaning structures.

Amnesia: The Study of Memory. Much of the research on implicit memory has derived support from studies of brain-damaged patients, most significantly amnesics. Typically amnesics, due most often to some brain injury, are incapable of retaining knowledge of new experiences but other cognitive functions remain intact. They generally demonstrate normal performance on short term memory task (recall and recognition test), but fail miserably on long-term memory task. Through a variety of experiments it was found that that "amnesic patients could indeed be influenced by recent experiences that they fail to recollect consciously" (Schacter, 1996, p. 166). Much of this influence seems to occur through priming.

Schacter (1996) tells an interesting story where a patient named Barbara, in her mid 20's contracted encephalitis which resulted in a loss of memory of large chunks of her personal past and much of her general knowledge of routines, facts of everyday life. Eventually she was able to learn to read and write again, but the disease left a profound amnesic syndrome, such that she could only handle simple clerical task. Schacter believed that he could help Barbara by tapping into her implicit memory abilities, such as teaching her skills and knowledge to deal with everyday challenges, such as keeping a job. In particular, he used a computer that was programmed to provide a repeated portion of a program based on the memory of the user. In essence the computer records how many hints the amnesic individual requires to carry out the program. If she can't complete a particular task, cues start to appear until she correctly completes the task. Barbara was trained to file information in a computer data base. After six-months of training with the priming of information Barbara was able to work effectively on the computer

data-base system. She eventually learned over 250 different rules, symbols and codes. However, since Barbara relies heavily on implicit memory to learn complex task it does come with some disadvantages, such that the memory acquired through priming is quite inflexible. In essence, she responds to a visual perception of commands, without any in-depth comprehension, suggesting that she lacks deep understanding of the underlying concepts of how the information is filed in the computer.

Implicit Memory and Perspective Transformation. Barbara's story as well as the other research on the different forms of implicit memory reveal the existence of subterranean world of nonconscious memory that has a tremendous influence on how we think and act. It would seem only obvious that implicit memory would also have influence on the transformation of meaning structures outside our focal awareness. As a review of recent research on transformative learning revealed (Taylor, In press) some participants experienced a perspective transformation without critical reflection, such that it seem to occur on an implicit level. One explanation for the change in meaning perspectives among the participants, independent of reflection and conscious awareness, is understanding their implicit learning of new skills and habits. As mentioned earlier skills and habits (procedural knowledge), such as driving a car or riding a bike, are often nonreflective actions that "take place outside focal awareness in what Polanyi (1967) refers to as tacit awareness" (Mezirow, 1991, p. 106). They can be learned and improved upon outside one's conscious awareness. For example, when individuals attempt to live in a new culture they have to develop many new habits, such as local greetings, customs, and daily routines. Particularly new participants working in developing countries often struggle with the elements (e.g., weather, scarcity of water, insects, sanitation) on a daily basis and have to develop new ways to lessen the impact the elements have on their lives. Accomplishing many taken-for-granted routines (e.g., preparing for bed) from their primary culture can require participants to develop new and sometimes elaborate routines (ensuring a mosquito free environment) in the host culture. Over time these daily routines become habit, operating at an implicit level. This suggests that possibly by the very act itself of taking on and practicing new skills and habits without reflection, meaning structures are altered on an unconscious level. A perspective transformation could also be explained by other forms of implicit memory. For example, consider people who are vulnerable to change due to a recent disorienting dilemma in their life. They very often begin responding to events and relating to others in new and different ways but can't explain where, how, or why they learned these new behaviors. Much of this change could be explained by conditioning-unconsciously learned behaviors in response, for example, to stress or fear. However since many of these new habits, skills, behaviors are inaccessible via introspection what is the role of critical reflection in relationship to implicit memory?

Role of Critical Reflection in Memory. As research from the field of neurobiology and psychology begins to provide insight into the change of meaning perspectives on an implicit level it also raises issues about the role of critical reflection in the fostering of transformative learning, since many of these implicit memories are inaccessible through introspection. There has been "a swing from interest in deliberate strategies to interest in automatic, unconscious

(even mechanistic!) processes, reflecting an appreciation that certain situations (e.g., recognition, frequency judgments, savings in indirect task, aspects of skill acquisition, etc.) seem not to depend much on the products strategic, effortful or reflective processes" (Johnson & Hasher, 1987, p. 655). In essence, people can demonstrate many skills, tasks, and cognitive abilities, though are unable to explain how they occur and where or when they learned them. One area that sheds further light on this phenomena is research in the field of psychology that has explored the effect of verbal processing and reflection on memory. Studies in this area have shown that giving attention to implicit memories through verbal processing, particularly with an intent to recall previously seen visual stimuli (faces), interferes with retrieval. (Schooler & Engstler-Schooler, 1990). In a series of six experiments it was found that the "the verbalization of a visual memory, such as a face, can foster the formation of a nonveridical (untruthful) verbally-biased representation corresponding to the original visual stimulus. Access of this verbally-biased representation can then interfere with subjects ability to make use of their intact visual code" (p. 62). Many nonverbal stimuli (e.g., faces) cannot be adequately recalled in words, but can be recalled visually. Recollection in the same modality can be veridical (genuine), such that verbalization did not impair one's verbal memories.

Other findings "hypothesize that contrary to conventional wisdom, introspection is not always beneficial and might even be detrimental under some circumstances" (Wilson & Schooler, 1991, p. 181). A good example is the skills involved in riding a bicycle, a task most of us can do easily, but when we attempt to retrieve from memory and explain the skills involved our automatic behaviors can be disrupted. Further research demonstrated that reflecting on the reasons we make, at times can lead to decisions and preferences that contradicted expert opinion and reduced peoples satisfaction with their choices. These studies "suggest that it may not always be a good idea to analyze the reasons for our preferences too carefully" (p. 191). Consistent with these studies it has been found that participants who were aware of how and why they felt about a particular object and could easily verbalize related attributes, were more immune to the negative effects associated with introspection. This research does not rule out the need for introspection, but recommends that at times, an unexamined choice is worth making. It means trusting what you learned on an implicit level and not always resorting to critical reflection when reasoning and making decisions.

This emphasis on trusting one's implicit memory and its relationship to introspection seems to be consistent with other earlier research that encourages a more whole-person approach when fostering transformative learning. Multiple studies infer to its significance in a variety ways, such as intuition (Brooks, 1989), affective learning (Clark, 1991; Scott, 1991; Sveinunggaard, 1994), and the guiding force of feelings (Hunter, 1980; Taylor, 1993). The Group for Collaborative Inquiry (1994) in a recent study reconceptualizing transformative learning process identified the significance of whole person learning-"awareness and use of all the functions we have available for knowing, including our cognitive, affective, somatic, intuitive, and spiritual dimensions" (p. 171). In essence, the more ways of knowing we engage the easier it will be to trust what we know implicitly.

In conclusion, I believe greater attention needs to be given to the role of memory, particularly implicit memory that occurs outside our conscious awareness in relationship to transformative learning. The study of implicit memory from the field of psychology and neurobiology offers

adult education practitioners new insights for the challenging practice of fostering transformative learning and it offers adult education research, a practice often devoid of the hard sciences, a greater understanding of essential components of transformative learning theory.

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