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THE LEARNING ORGANIZATION

eLearning as energetic learning

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Abstract

Purpose—This paper explores the role of emotion in learning, specifically, eLearning and its relationship to the phenomenon called energetic learning.
Design/methodology/approach—After first presenting operation definitions, we look through the lens of new findings in neuroscience to build an understanding of the role of emotions in learning. We then focus specifically on how eLearning systems contribute to energetic learning, providing examples of eLearning platforms and software programs currently available that have specific attributes contributing to energetic learning.
Findings—With technology comes a natural excitement in terms of connectivity and its support of self-driven, experiential learning which is part of our evolutionary heritage. As our understanding of the neuroscience and biology of human learning advances, we are beginning to better understand the personal needs of individual learners. Bringing these needs together with eLearning system capabilities will offer a significant jump in our learning rate and efficiency as we move into a future filled with change, uncertainty, complexity and anxiety.
Originality/value—Introduces the concept of energetic learning with specific focus on the contribution of eLearning to energetic learning.
Keywords: energetic learning, eLearning, emotion, eLearning systems, knowledge, brain, complex adaptive system
Paper type Research and technical paper

Introduction

eLearning systems are playing a leading role in both informal continuous learning and formal education structures in the business and academic communities. In the national report of online learning, *Learning in the 21st Century*, one out of three students selected online classes as a component of their ideal school and 77 percent of teachers believe that technology makes a difference in learning. While increased choices, flexibility, and connectivity certainly contribute to these findings, there is also a leveling that emotionally engages the learner. The report concluded that as online learning becomes integrated into the day-to-day lives of individuals, there is a break-down of the compartmentalization of education. "Everyone becomes a learner and an expert with opportunities to seek and share what they know, critique what they learn, and become more engaged and involved with the global community" (Netday and Blackboard, 2006). Thus learning becomes part of everyday work (and play) and moves from a "push" model to a "pull" model driven by individual choices.

We begin this exploration with an operational definition of knowledge. Recognizing the important role that emotions play in all learning, we then introduce the concept of energetic learning and explore the ways that eLearning can support and enhance energetic learning. Next, we focus on eLearning systems in support of personalized learning. As technology continues to exponentially advance, the adaptivity and robustness of eLearning become feasible and powerful attributes that can satisfy the specific needs and idiosyncrasies of individual learners. Simultaneously, as our understanding of neuroscience and the biology of human learning advances, we are beginning to better understand the personal needs of individual learners. Bringing these needs together with eLearning system capabilities can accelerate our learning rate and efficiency as we move into a future filled with change, uncertainty, complexity and anxiety.

Setting the stage

Embracing Stonier's description of information as a basic property of the Universe—as fundamental as matter and energy (Stonier, 1992; Stonier, 1997)—we take information to be the result of organization expressed as any non-random pattern or set of patterns. Data (a subset of information) would then be simple patterns, and while data and information are both patterns, they would have no meaning until some organism recognized and interpreted those patterns. In other words, meaning comes from the combination of non-random patterns and an observer who can interpret these patterns to create a message (Bennet and Bennet, 2007). It is only when the incoming patterns from the environment are integrated with the internal neural patterns within the brain that they take on meaning to an individual. These units of understanding are referred to as semantic complexes.

When considering learning and knowledge, neuronal patterns offer a useful perspective (Stonier, 1997). As a high-level description, knowledge exists in the human brain in the form of stored or expressed neural patterns that may be activated and reflected upon through conscious thought. As a broad, operational (functional) definition, *knowledge can be considered the capacity (potential or actual) to take effective action in varied and uncertain situations* (Bennet and Bennet, 2004). Note that use of this functional definition points to knowledge as a creation of the human mind since computers (at least for the present) cannot be programmed to deal with varied and uncertain circumstances.

Knowledge is composed of two parts: Knowledge (Informing) and Knowledge (Proceeding) (Bennet and Bennet, 2008). This builds on the distinction made by Ryle (1949) between "knowing that" and "knowing how". Knowledge (Informing), or Kn_I, is the *information* part of knowledge, representing insights, meaning, understanding, expectations, theories and principles that support or lead to effective action. When these are viewed separately they are information; when used as part of the knowledge process they are considered knowledge. Knowledge (Proceeding), or Kn_P, represents the *process and action* part of knowledge, the process of selecting information from a situation at hand (and its environment) and mixing it with internal information to develop new information patterns that guide and drive effective action.

Building on our definition of knowledge, learning is considered the *creation* or *acquisition* of the ability (potential or actual) for people to take effective action. From a neuroscientific perspective, this means that learning is the identification, selection and mixing of the relevant neural patterns (information) within the learner's mind with the information from the situation and its environment to create understanding, meaning and anticipation of the results of selected actions. The term *energetic learning* borrows from the formal definition of Energetics, the scientific study of energy flows and storages under transformation (Wikipedia, 2008). At the individual level, energetic learning is considered a state of *high energy flow* within the brain of an individual who is very interested, perhaps passionate, about a specific learning phenomenon, situation or process or an area or field of study; and/or energized, excited, confident, open and desirous of creating and exploring new ideas. Emotion is foundational to learning. As Johnson and Taylor (2006) explain, "The chemicals of emotion act by modifying the strength and contribution of each part of the learning cycle. Their impact is directly on the signaling systems in each affected neuron" (p. 7). This is the essence of energetic learning.

While electronic learning (eLearning) could be considered any virtual act or process used to acquire data or information, or to create knowledge, when the term is used today it is most often in the context of computer-based learning support systems, and periodically associated with advanced distributed learning technology. Energetic learning and eLearning are both physical experiences; energetic learning in the sense of chemically-induced positive emotions attached to the process of learning or the content of the learning, and eLearning in terms of the learner's involvement with technology. Both energetic learning and eLearning deal with patterns; energetic learning in the sense of patterns in the brain complexing with incoming patterns and cascading up and down in hierarchical relationships, and eLearning in terms of the patterns of bits and bytes presented as visual and audible information to the learner. Both energetic learning and eLearning are experiential learning and, as explicated below, are quite compatible. Ideally, good eLearning would facilitate an experience with the learner that creates emotional tags, thus enhancing the ability to learn from that experience. This is discussed further below.

An *eLearning system* encompasses and integrates critical learning conditions such as feedback, re-enforcers, motivators and information sources that enable learning to occur (Salomon and Perkins, 1998). A *Learning System* (used here with initial caps) is composed of the learner in communion with an eLearning system. In the context of future technologies, the learner can be considered an intelligent, complex adaptive system coevolving with its eLearning system; intelligent because the learner has an objective to learn and seeks to fulfill that objective, and complex because the mind is a highly complex system, learning is a complex process, and the eLearning system is moving into complexity as it identifies and adapts responses to learner patterns. Adaptive implies that the learner—and presumably the eLearning system—changes and adapts as learning occurs, and such changes typically impact the environment to some degree. Thus the learning process is autopoietic in the sense of Maturana and Varella's discussion of an organism's internal structural adaptation to its external environment (Maturana and Varela, 1987).

Why energetic learning is important

Brain activity is the result of the absorption of energy by neurons as they fire. The human brain has about 100 billion neurons, with each neuron having up to 10,000 connections (Edelman, 1989; Hobson, 1994; Ratey, 2001; Begley, 2007). That's 10 to 100 times more connections in your brain than cells in your body. There's a neuronal network (patterns in the brain) for everything you have learned, every thought you have had, and every action you have taken (Zull, 2002).

The brain uses more energy as more neurons fire in the process of associating patterns, creating ideas (sequences of patterns) and learning in general. This can be measured. The development of sophisticated brain measurement instrumentation such as functional magnetic resonance imaging (fMR), electroencephalography (EEG) and transcranial magnetic stimulation (TMS) (Kurzweil, 2005; Amen, 2005) has facilitated an intense increase in neuroscience research and an understanding of how our brain functions. The fMR process provides indirect indicators of changes in blood flow (Andreason, 2005), that is, showing regions of the brain that are highly active through the direct measurement of the oxygen utilization. For example, we now know that in the minute you have spent reading this paragraph a number of synapses in your brain have changed, and the strength of some synapses and patterns of neural connections are different. We also know that the more you think about something (focus on it, reflect on it), the greater the physical change in your brain. We also know that the more connections new patterns (thoughts, etc.) have to historical memories of significance, the easier it will be to activate these thoughts in the future. The learning experience depends on associating patterns resulting from the "interactions between the physical constructs of neuronal networks inside the brain and the reality of the concrete world" (Zull, 2002, p. 209). The stronger the synaptic junctions in the pattern and the more the pattern is repeated, the easier it will be to recall in the future. This process has been explicated at length in earlier *VINE* articles (Bennet and Bennet, 2006; Bennet and Bennet, 2008),

Emotions play a large role in this process. In this context, emotions are considered signals or labels that are for the most part generated unconsciously. An emotional tag is linked to all information patterns coming into the brain. As Lipton explains,

> The evolution of the limbic system provided a unique mechanism that converted the chemical communication signals into sensations that could be experienced by all of the cells in the community. Our conscious mind experiences these *signals* as emotions. (Lipton, 2005, p. 131)

Thus, as part of our evolving learning system, memories and the emotional tags that gage the importance of those memories become part of an individual's everyday life. The *stronger the emotional tag*, the greater the strength of the connections (LeDoux, 2000) and the easier to recall. As Kluwe states, "Often we experience that emotionally arousing events result in better recollection of memories. It appears to us that we will not forget certain events in our life whenever they are accompanied by very pleasant or fearful emotions" (Kluwe, 2003, p. 51). This is true because *emotions have priority in our stream of consciousness*. Consciousness is comprised of a single, linear stream of thought patterns (Edelman and Tononi, 2000) and as such this mechanism of awareness can be filled with mundane facts or highly charged emotions. Through evolution (based on survival of the fittest) our brain has been wired such that the connections from the emotional systems to the cognitive systems are much stronger than the connections from the cognitive systems to the emotional systems. As LeDoux (1996) observes, "Emotions easily bump mundane events out of awareness, but non emotional events (like thoughts) do not so easily displace emotions from the mental spotlight" (p.19).

Not only can emotions preempt cognitive thought at the conscious level, but also since emotional processing can—and regularly does—take place outside of conscious awareness (LeDoux, 1996, p. 58), we may not be aware of what is driving our decisions and actions. Further, some studies have shown that our emotions are *more easily influenced* when we are not aware that the influence is occurring. The advertising industry regularly uses emotional cues (implicitly and explicitly) to persuade consumers to buy products (Packard, 1957). However, when understood, anything that can be used by others to manipulate us can also be used by us to manipulate ourselves. For example, by understanding that emotions are things that happen to us rather than things we order to occur, we can set up situations where external events provide stimuli to trigger desired emotions (LeDoux, 1996). We do this regularly when we go to the movies or visit an amusement park, or even when we consume alcohol or stimulate our palate with a gourmet meal.

Negative emotions appear to have a prominent presence in self-awareness and self-identity (Keenan, et al., 1999). This is because the right hemisphere of the brain (which is biased towards negative emotions that lead us to fight or distance ourselves from something or someone) develops in early childhood when we are developing our self-identity. Fear increases the chances of a child's survival; thus the emotions centered in the right hemisphere can override those centered in the left hemisphere (which with the expanded neocortex produces positive feelings related to humor, social affiliation and aesthetic responses) (Paradiso, et al., 1999; Wild, et al., 2003). The irony is that negative emotions do not generally promote learning. For example, it has been demonstrated that voluntary learning—choosing to learn—not only is marked by the absence of stress, but is also characterized by the presence of brain rhythms called theta waves which are present when you pay close attention to something (Begley, 2007, p. 68). In addition, the same fear that causes a fight or flight response can bring about negative long-term results for learning. As Byrnes observes,

> ... excessive levels of cortisol (a substance secreted by the adrenal glands during stress reactions) causes permanent damage to several regions of the brain, including the hippocampus (important for memory) and the locusceruleus (important for selective attention). Byrnes, 2001, p.181

Understanding and harnessing the power of emotion can improve an individual's ability to learn. Recall the old adage: *Follow your passion*. In the larger Learning System (the learner entangled with an eLearning system), this is the entry point to energetic learning. Passion is considered those desires, behaviors, and thoughts that suggest urges with considerable force (Frijda, 2000), specifically including Polanyi's assertion that positive passions affirm that something is precious, and that passion can be used as a determinant of what is of higher interest and great (Polanyi, 1958). A passion to learn or a deep passion related to the content of learning embeds strong emotional tags with what is being learned, directly impacting the *number* of synapse connections created and the *strength* of those connections. When positive emotions create this impact, learning becomes exciting and the memory of what is learned stays with us. Memory is further enhanced when learning includes meaning and understanding of the material.

Another aspect of energetic learning is the conscious intent to learn. In a study of information-processing receptors on nerve cell membranes, Pert discovered that emotions were not simply derived through a feedback of the body's environmental information, but that through self-consciousness the mind can use the brain to *generate* "molecules of emotion" and override the system (Pert, 1997). This self-conscious mind processing occurs in the prefrontal cortex (on the scale of evolution, the *newly evolved* organ that observes our behaviors and emotions) (Lipton, 133). This portion of the brain has access to most of the data stored in our long-term memory bank and is the executive part of the brain that solves problems, makes decisions and initiates actions (Goldberg, 2001). What this means is that our minds can *chose* to embed stronger emotional tags with specific incoming information. For example, this occurs when we engage new ideas and become excited about the potential offered by these new ideas for ourselves, our organizations, or our world. LeDoux believes that this struggle between thought and emotion may ultimately be resolved, by "a more harmonious integration of reason and passion in the brain, a development that will allow future humans to better know their true feelings and to use them more effectively in daily life" (LeDoux, 2002, p. 21).

Meanwhile, it is now clear that heredity cannot be fully blamed for an individual's inability to learn. Discoveries in neuroscience now indicate that DNA blueprints passed down through genes are not set in concrete at birth. As Lipton exclaims, "Genes are not destiny!

Environmental influences, including nutrition, stress and emotions, can modify those genes, without changing their basic blueprint" (Lipton, 2005, p. 67). Not only can an individual change her own DNA, but an individual can affect the DNA that is passed on to future generations via the Double Helix (Reik and Walter, 2001; Surani, 2001).

eLearning systems themselves contribute to energetic learning

The question is begged: How can eLearning best assist an individual in becoming an energetic learner? Clearly, there is no greater resource to information access than that offered through connected eLearning systems. The unlimited potential offered by an Internet-connected world may be the single most exciting development of the 20th Century, if not in the entire history of humanity; and Internet-savvy learners have a natural excitement as they sit at the keyboard connected to the world! The relevant question becomes, is a learner seeking information or knowledge? If it's an information dump that is needed, that is easily accommodated by a hook-up and providing the skills to search, select and retrieve information from the Internet. But if it's knowledge that is needed, then learning must be interactive and specifically tailored to each individual. Below we forward the value of eLearning systems—specifically in terms of their contribution to energetic learning—by first addressing the differences between information transfer and knowledge sharing, then providing three examples of eLearning in support of positive learning experiences followed by a short discussion of the semantic web concept in support of knowledge sharing.

The transfer of information is less sensitive to individual characteristics than the creation of knowledge. For the transfer of information, the learner simply has to memorize it, understanding its basic meaning, then apply it accordingly. Change the situation a bit and the incoming information may not solve your problem! This requires knowledge, the ability to take effective action in varied and uncertain situations. In order to create knowledge, the learner must not only understand the incoming information, but also mix it with his own internal experience to create the desired Knowledge (Informing) and Knowledge (Proceeding) within himself, that is, he must develop a deeper understanding of the information, insights into the situation, and anticipate the results of potential actions.

Knowledge *starts* with information, with an individual gathering the requisite Kn_I necessary to develop sufficient understanding of the meaning of that information in order to take effective action. An eLearning system moves from supporting information awareness to facilitating knowledge awareness when the focus of the system shifts from information storage, retrieval and transfer to creating and supporting collaborative environments for knowledge sharing. For example, knowledge (proceeding) can only be stored in a computer as it pertains to a specific, predesigned situation with a clear, logical, specific solution (a situation that in today's world may be rare). Such thinking would be more of a memory goal than that of developing or sharing knowledge.

Similarly, eLearning has been proven effective in skill training where specific information, causal relationships and repeated practice are required. Here, the learner must adapt to the needs of the skill and eLearning proves very cost effective. While this training may be done by video with student feedback, some content may require group training with an eLearning system, and perhaps a virtual instructor. Whichever the case, skill training is focused on information, manual operations and logical thinking with clear, predetermined results. This type of skill training may or may not engage the learner in energetic learning. However, if the desired performance requires not only skill but also a good understanding of the theory, nuances and uncertainties in the operation, the adaptivity and robustness of the eLearning system becomes significant to the learning experience. Now it is necessary for the eLearning system to adapt to the learners' needs in order to help them create the *knowledge* needed to deal with unexpected situations. As we might expect, physical and flight simulators, games, and even narratives—which can carry strong emotional tags—can be effectively employed in eLearning systems (Quinn, 2007). Progressive games offer the opportunity for long-term engagement. Wiig points out that the importance of a business simulation game lies in the learner's opportunity to participate actively over a period of time in an evolving situation. Thus learners are gathering embodied knowledge and internalizing how to assess situations, the implications of and results from the actions they take (Wiig, 2004; Bennet and Bennet, 2008).

This discussion has surfaced some clear advantages to eLearning in terms of supporting positive learning experiences. A first example is, with the advent of the Internet, the potential for immediate, just-in-time learning when it is needed and desired and a "no limits" experience in terms of availability and accessibility of information. A second example is, given the need for and advantages of collaboration, the opportunity to collaborate in world-wide learning experiences. Whether participating one-on-one or in a group collaborative situation, different viewpoints and perspectives can prove exciting and accelerate learning. There are more collaboration systems described as eLearning systems than there are authoring and service delivery systems, and most service delivery systems include collaboration and social networking tools. An assumed given is that participants are familiar with collaboration techniques such as appreciative inquiry, dialogue and critical thinking. Critical thinking is considered an essential collaborative tool because it encourages individuals to question their own beliefs and assumptions thereby opening the mind for other views and perspectives.

In a 2006 market research study by Ambient Insight, the U.S. market for real-time collaboration-based learning products and services was over $2.6 billion and growing at a five-year compound annual growth rate of 34.5 percent (Adkins, 2007). This trend has co-evolved with the expansion of communities of practice as work-sponsored learning structures. For example, in *The Story Behind Defense Acquisition University's Reinvention of Training*, Anderson and Hardy state,

> Communities of Practice are one of our highest growth areas. We have almost twenty thousand registered members making almost fifty thousand contributions a month. We get over 2.5 million page visits per month and over 10 million page views. It's been an amazing addition to our university and an indispensable resource for the workforce. (Anderson, et al., 2008, p. 119)

In the formal U.S. education system, special collaboration software solutions are offered that provide safe collaborative environments for students from kindergarten to graduate levels. Examples are *Knowledge Forum* (making information accessible with multiple vantage points and multiple entry points) and *FirstClass* (supporting student publishing of blogs and podcasts). An example of open source collaborative learning software would be *Sakai*, which supports teaching and learning, both ad hoc and research collaboration. These environments engage youths in dynamic information exchange and personally-instigated social learning situations. In this setting, a popular eLearning software package is *Blackboard*, which includes a module for building online communities to improve information flow, and a module designed for learners to collect, present and reflect on their learning experiences, providing positive feedback to support sustained learning. During these collaboration efforts it is very important to recognize the distinction between information sharing and knowledge creation and sharing.

A third example is that eLearning can mitigate potential embarrassment in a classroom or human dialogue since it offers the opportunity for thinking before contributing. This may significantly enhance the learning process. However, note that "cold" language in an eLearning system may put-off a learner and create an uncomfortable atmosphere. Fortunately, this was a lesson learned early in the design of eLearning systems such that a "soft" compassionate language has been embedded within dialogue-driven programs and other interactive systems. For an individual who needs time to digest new ideas, eLearning provides a comfort zone. Long-term memory can be enhanced for any specific information through repetition. An eLearning system can precisely repeat over and over again what it is communicating; a human rarely can or will. Additionally, when designed to assess and provide quick feed-back from a positive perspective, an eLearning system can punctuate positive learning experiences and mitigate mis-learning. For example, if learning content is misunderstood the eLearning system can lead and support the learner to create their own improved understanding and *feel good about it*. A learner does not learn until she creates her own interpretation and understanding in terms of personal history, current beliefs and assumptions, and frame of reference. Therein lies the challenge to eLearning systems if they are to support the sharing of deep knowledge, that is, thorough understanding and good insights into the nature and operation of the situation.

Over the last few years there's been much discussion about development of a semantic web, the term used by Tim Berners-Lee to describe his vision of the Web as a universal medium for data, information and knowledge exchange. The semantic web would not only provide content, links and transactions between people and computers, but would finally make the dream of technology as an intelligent agent a reality, with machines talking to machines accomplishing the day-to-day mechanisms of trade (Berners-Lee and Fischetti, 1999). The term "semantic" is "of or related to meaning", specifically referring to language. While the level of "meaning" conveyed through the Semantic Web would vary substantially—dependent on the value and organization of information and the knowledge and skill sets of the individual using it—this "meaning" would be primarily associated with Knowledge (Informing). This is true because it would be impossible to convey all potential situations of applicability, and the information and its meaning would vary with each situation and its context. Clearly, the semantic web would facilitate dialogue and the sharing of information, and perhaps the sharing of knowledge as we learn more about the conversion of information to knowledge within the human mind. eLearning could become highly useful in knowledge sharing if it became context intelligent, semantically smart and dialogue proficient. There are very real challenges to address before this will be possible, not the least of which is semantic and syntactic interoperability. However, given enough time, this vision will undoubtedly become a reality.

Personalizing eLearning

A necessary step for effective eLearning systems is to support and assist the learner in creating Knowledge (Proceeding) through the recall and internal association of the right Knowledge (Informing) to determine the actions necessary to solve a problem. This requires the learner to practice solving problems to embed the processes of taking effective actions while reinforcing and demonstrating the effectiveness of their knowledge. Since a great deal of knowledge is tacit, and therefore cannot exist in a computer, eLearning systems cannot store or share all of the requisite Kn_I. However, using the information that is stored, an eLearning system can be designed to help learners surface their own tacit Kn_I related to specific areas of learning. This can be accomplished through a system that asks pertinent questions, evaluates answers according to specific situations and context, and "guides" learners towards becoming aware of and linking their own past experiences and knowledge to this new information.

In other words, there are no simple solutions. eLearning provides a platform for a *divergent learning approach* where there are multiple solutions and creative thinking is needed to solve problems. Divergent learning emphasizes concrete experience and reflective observation. It's greatest strength is the focus on imaginative ability and awareness of meaning and values (Kolb, 1984). For example, many personnel problems do not have a nice neat solution and require creative and situational-dependent thinking. The eLearning system participates in divergent learning by creating an active information environment where learners can both practice solving problems and creating their own problems to solve. When problems are posed with open-ended solutions, learners are pressed to think more about the subject, ask questions, and explore different *learning paths*. Glimpses of these approaches are beginning to appear in eLearning systems. While not yet student-driven, nor in the context of complex adaptive, an example of an open source program that helps teachers develop learning paths for students (and also uses the Wiki to write collaborative documents) is *About Claroline*. As the process of exploring different learning paths guides learners to discover insights on their own concerning the information, learning is enhanced. Introduced earlier, this is because the brain—as a knowledge seeking organism choosing its own path—maximizes its attention and focus, thereby creating emotions and releasing chemicals that enhance neuronal activity (Edelman and Tononi, 2000), positively reinforcing the brain's desire to learn.

Another significant aspect of personalizing learning is that information must be relevant, acceptable, understandable and motivational taking into account the individual's belief set, personal goals, cultural background, communication and learning styles, and prior knowledge, expertise and experience. From cognitive to emotional to embodied preferences, the uniqueness of the individual learner is a primary factor in learning. eLearning systems have the capacity to provide a spectrum of learning approaches to help accommodate these differences. Next-generation learning environments are being designed to support personalization, adaptivity and on-demand learning object generation (Brusilovsky, 2001). For example, this is the core focus in state-of-the-art Adaptive Hypermedia Systems (AHS) where a service-oriented architecture supports adaptive personalization through the use of individual services for the sourcing of learning content, the personalization of learning offerings, and the presentation of those offerings (Lawless, et al., 2008).

Instead of one learning model driving an eLearning system, there may be ten or twenty or thirty, each with a different perspective that would lead to the feel and semantics of the explanation. As the learner finds their own path, these patterns become entangled with the eLearning system, building a personalized program providing the capacity for the learner to navigate the path based on comfort, choice, and learning speed. Searching techniques in many software systems already include social tagging and ranking, and intuitive pattern development. User-defined learning paths are available in some full-spectrum and learning delivery systems such as *Desire2Learn*. In addition, a number of authoring programs such as *Lectora 2008* by Trivantis incorporate Variable Knowledge Objects to create branched learning scenarios. While eLearning systems cannot yet provide the full-spectrum transfer of embodied tacit knowledge that is possible over time between one human and another, materials can be communicated in totally different ways to provide the learner with a high probability of understanding the concepts presented. An advanced eLearning system could provide different varieties of the information content based on a spectrum such that the learner could resonate with the information provided by some part of the spectrum. One example is basing this spectrum on the MBTI, which describes 16 different preferences for accessing and processing information. Information around a specific topic could provide 16 different deliveries of information that resonate with the corresponding MBTI types (Kroeger, O. and Thuesen, J.M., 1988; Myers, I.B. with Myers, P.B., 1993; Hirsh, S.K. and Kummerow, J., 1997; Kummerow, J.M., et al., 1997). Another presentation form could be based on the Kolb learning styles inventory (Kolb, 1984). But this still doesn't' address the fundamental issues of optimizing learning capacity through understanding the specific nature and context of a situation, or the learner's history and frame of reference. At least not yet.

For many years there were attempts to build computers that can think like humans. It is not simply the large number of connections (synapses) in the human brain that make this difficult, and it is not *what* the human brain does but understanding *how* it does it—that step portrayed in a myriad of cartoons that says "then a miracle occurs"—that challenges the designer's intellect. Building on the early connection machines made by Thinking Machines, Inc. (Hillis, 1987), at the turn of the 21st century Brown University set out to build a brain-like computer, what was called the Ersatz Brain Project. While only focusing on a microcosm of the brain, when the project was over the team had recognized that by requiring software to use brain-like constraints new ways to tackle old problems emerged (Anderson and Allopenna). Further, they realized that an important application of such a machine would be the realization of a large network where individual nodes having complex internal structures would provide flexibility and associative capabilities beyond semantic networks. The understanding was beginning to be voiced that as we design machines to mimic our minds we need to make sure that those machines are equipped with sufficient diversity. They need a similar diversity to that which distinguishes humans from most other animals and from machines built in the past, "stemming from what we each have made of ourselves: a colossal collection of different ways to deal with different situations and predicaments" (Minsky, 2006, p. 6).

Moving beyond Artificial Intelligence approaches to exploration of this technology to aid learning and decision-making, in 2005 cognitive science and technology became a core research focus for Sandia National Laboratories. For Sandia, cognitive systems include technologies that utilize computational models of human cognitive processes or knowledge of specific experts or other individuals (Sandia, 2007). These systems accurately infer user intent, remember experiences and provide simulated experts to help users analyze situations and make decisions. Through modeling a virtual "you" and simulating thinking patterns, individual strengths can be reinforced and weaknesses mitigated. Imagine this as the basis for a learning system, a human-technology partnering that is already beginning to happen today. This is clearly not the AI of the past. As described by Chris Forsythe, intent is modeled to a specific individual; knowledge is associative with emphasis on pattern recognition not just rule-based representations and logic; and this is a dynamic complex system that may easily adapt to changing circumstances (Forsythe, 2003).

Emphasizing the significance of emotions in learning, out of MIT in 1997 emerged the field of affective computing. Affective computing is described as computing that relates to, arises from or deliberately influences emotions (Picard, 1997). Embedding the ability to recognize emotions into machines was driven by Picard's belief that putting emotions in machines would not only make them more human (thereby improving human-computer communication), but could lead to a more human decision-making process supporting decision-makers and learners. Further, "When we succeed, a feeling of pride might encourage us to keep on going and push ourselves even harder to reach even greater goals" (Neji and Ben Ammar, 2007). Since emotions are contagious, it is this contagious nature that Neiji and Ben Ammar felt was potentially transferable and beneficial to the virtual world. Recognizing that the use of emotions to complement and indeed facilitate communication in collaborative virtual environments had been vastly under-explored, they developed a collaborative affective eLearning framework aimed at reintroducing emotional and social context to distance learning while offering a stimulating and integrated framework for affective conversation and collaboration. In essence, they were proposing an emotional framework for an intelligent emotional system.

Final thoughts

Through the process of evolution the human mind was designed to learn for itself. Cave men learned via a watching and doing loop. It wasn't until the last few hundred years that the education process took on the rigidness of industrial age efficiency, herding children together in school rooms in order to turn out large numbers of individuals labeled as "educated". This process, of course, is counter to learning in terms of evolution of the species. Neither man nor machine can force an individual to remember, understand, or feel good about learning, so necessary for living and surviving in an uncertain and complex world. Learning is a very private affair, dependent upon the needs, feelings, history and expectations of the self-organizing system made up of the mind, the brain, the body, the spirit, the conscious self, and—in our example, and in our world—the eLearning system.

Focusing on the value of energetic learning, with technology comes a natural excitement in terms of connectivity to the world, as well as its capability to support self-driven, experiential learning which is part of our evolutionary heritage. This excitement can help accelerate our journey as we continue to discover our full potential as learners, consciously engaging and embedding emotional tags and fully exploiting the beauty and complexity of our mind-brain-body-spirit combination. As technology moves into a closer partnering relationship with the human mind, anything is possible.

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