Encouraging Intellectual Diversity in Education

Creating a student-teacher evaluation form that provides the feedback necessary to implement a creative environment supportive of diverse-multiple intelligences

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Authors: Brian Chan with Julie M. Fagan, Ph.D

Summary

Every mind is endowed with a unique wiring of neural networks. Some minds are wired to handle a lot of information at once; other minds can process only a little information at a time, but with great accuracy. Yet, our educational system does not acknowledge the diversity of multiple intelligences, and prefers to shrink students down to a list of scores that will determine their lives all through school and their future careers. To foster diverse intelligences, we must reform education. One solution may be to provide an creative environment in the classroom encouraging of people’s diverse, multiple intelligences. Creating an evaluation that will provide an instructor with the student’s personal feedback is a small step towards developing such an environment.

Video Link: http://www.youtube.com/watch?v=OISB-Vo_F1Y&list=UUts4_1WyqXMmVDfu9ZffstA&index=6&feature=plcp

Contents:
● Introduction: Education and Diverse Intelligences
● Memory
  ○ Short-term memory
  ○ Working memory
  ○ Long-term memory
● Creativity
  ○ Neural-Pathway of Creativity
  ○ Traits of Creativity
Introduction: Education and Diverse Intelligences
Each of us is unique due to the complex wiring of our neural network. Some of us have brains that are wired to handle a lot of information at once, others have brains that can absorb only a little information at a time--but with great accuracy. While some can recall and store information with precision and speed, others possess the ability to access facts more slowly and with less precision. And some people, may prefer to brew their own original ideas rather than utilizing the ideas of others. Due to our highly complex and inborn circuitry, we face failures and successes during the times our abilities are tested and challenged.

Our mental abilities can be separated into sets of neurodevelopmental functions. These neurodevelopmental functions are tools for learning and for applying our knowledge. An example of a neurodevelopmental function in memory is the ability to visually recall things that we’ve encountered in the past. Another example is the capacity to store and retrieve related information, such as knowledge of the alphabet or events that culminated into the Cold War (8).

There are a vast number of these neurodevelopmental functions within our mental toolbox. Some of these tools come innately and other functions are acquired during our development. Take into account that most tasks call upon a combination of functions. Considering the intricacies that go into executing a task, it is not surprising that breakdowns, causing issues such as concentration and following instructions, are common (8).

But these issues often lead to unexpected gifts. In fact, people who have concentration issues are also more likely to have a high degree of creativity. The lack of focus actually allows a richer concoction of ideas within one’s consciousness. As a result, they end up letting more of the world in. Instead of approaching the problem from a predictable perspective, they are more likely to be open to all sorts of approaches some of which prove useful (7).

Unfortunately, our educational system overlooks these gifts and stresses thinking within set boundaries. Our system also emphasizes functions that store and recall large amounts of facts, skills, and concepts across unrelated subject areas and topics (1). Consequently, education perpetually imposes a burden on the neurodevelopmental functions that make up memory capacity (8). Instead of nurturing creative minds, we mechanically build students that think in a one question-one answer mentality and inadvertently sap them of their creative energies and inborn gifts.
Almost all educational reforms attempt to “improve” the standards of education. However, these reforms don’t change our educational system to nurture the diverse multiple intelligences; instead, they reform our students to the system. To elucidate a better solution we must explore what our current educational system focuses on, which is memory. We must explore another quality that our educational system doesn’t foster: creativity.

**Exploring Memory**

Nothing is ever learned without some utilization of memory. A student may be able to comprehend a fact, concept, or process as it is being demonstrated, but without memory, none of it can be retrieved or applied. Only when there is proper collaboration of memory and comprehension can learning succeed (1).

Memory is a complicated multi-layered process that operates at many different brain sites, a process still not fully understood even by neuroscientists. What we do know is that our mind’s storage processes can be divided conveniently into three types of memory: short-term memory, active working memory, and long-term memory (1).

**Short-Term Memory:**

One of the functions of short-term memory is to serve as our mind’s relay stations. As information enters our minds, several different scenarios can occur: the information can be sent to long-term memory for later use; immediate utilization and then forgotten; or both: utilization and then saved for future usage (or never used and forgotten) (9).

Our short-term memory is limited in its capacity. It is common to administer a test called digit span to test the capacity of an individual’s short-term memory—the individual is given a sequence of numbers and immediately has to repeat them in the correct order. What we find is that older children and adults can absorb and repeat about seven numbers (2). What this indicates is that the space in short-term memory is absurdly small. Thus, we must recursively break down problems to deal with this limitation. Furthermore, when we encounter large amounts of information at once, we cope with this problem by undergoing a process of recoding the incoming message to a manageable size so that it can fit in the limited space of our short-term memory. Essentially, we must paraphrase the information that we have just absorbed to a more digestible size (1).

In understanding the basic phases our short-term memory undergoes, we can identify possible problems people may encounter. Some people may not be able to hold beyond 4 or 5 length sequences in their minds; other individuals with short-term memory dysfunctions may have difficulty recoding. A student with short-term memory dysfunction could be a great speaker with a mature vocabulary, an intuitive mathematician, socially strong, and a strong grasp of what they
have already learned. However, in terms of quickly grasping instructions, their short-term memory may not be able to hold onto a long-winded explanation of what to do. In school this usually results in accusations of ignoring verbal instructions and not paying attention when in reality, the explanations may have overloaded a student’s sputtering short-term memory. Essentially, the processes that are entirely natural and nearly instinctive for some children, may have to be taught explicitly to others (8).

Active Working Memory:

Working memory can be described as our work desk, where our intentions or components of any activity are held and processed until we deem that activity complete. More specifically, working memory accomplishes specific duties (1):

- Provides mental space for the combination or the development of ideas.
- A mental adhesive holding together parts of a task while engaging in that particular task.
- A lobby where information from one’s short-term memory can combine with information from one’s long-term memory.
- Serves as a place to hold multiple immediate plans and intentions.

As a space for ideas to form, working memory is vital to how a student processes thoughts, listens, and interprets material. This space allows for us to keep track of the events that happened at the beginning of a story while reading its last few sentences of that book. Working memory also serves as a temporary holding site for information coming out of your long-term memory. If someone mentions the name of a person you know, you would begin to think about that individual and piece together various pieces of personal knowledge present in remote parts of your long-term memory (8). A person with a weakness or dysfunction in their working memory could have an incredible memory for minute details, the ability to respond in elegant, clear and complex sentences, and incredible long-term memory. They may be perfectly able to construct sophisticated and compelling ideas, but may be unable to stay on topic while writing down these ideas due to the tax on concentration when focusing on spelling, punctuation, and forming the letters. The individual could have trouble keeping track of the ideas while using or thinking about them, yet teachers may view a student with weak or dysfunctional working memory as lazy and unmotivated.

Long-Term Memory

A person with long-term memory dysfunction may be an incredible problem solver, a prolific creative thinker, with the ability to do very well in subjects that emphasize reasoning,
understanding and creativity but inevitably underachieves or fails when required to rely on heavy memorization. It usually isn’t because their long-term memory has lost the information, but because it has been misplaced (8).

Most of the challenge for long-term memory is to store information systematically and put the information where we are most likely to find it later. For that reason, long-term memory consists of two stages: filing and access (1). Filing is the act of systematically entering information into the long-term memory storage system, while access is the process through which we subsequently locate that information. A student with long-term memory dysfunctions may have a problem with filing and/or access, which results in struggling during heavy memorization (1).

**Creativity**

A common misconception is that some people are just more creative than others, that originality is a predetermined personality trait. However, if merely exposing people to the color blue can double their creative output, then the idea that an individual’s creativity is fixed is likely to be just a myth (7). This fact strengthens the idea that creativity is not only innate but can be nurtured in the right environment. Understanding the neural pathway of creative insight, the traits related to creativity, and the prior mental stages necessary for that sudden creative insight is beneficial to understand the environmental needs for cultivating a creative mind.

**Neural-pathway of Creativity**

While creativity in the brain isn’t very well understood, we do know that the source of innovative ideas lies in the prefrontal cortex. Close collaborating with other brain areas, the prefrontal cortex can generate creative ideas. Prior to delivery to the prefrontal cortex, the process begins with the information being sent and processed by dopamine neurons. Within the prefrontal cortex the thought enters working memory. If this new information leads to any useful thoughts or conclusions, then a new connection which helps to solve the problem is formed. That new thought is then transmitted back to the dopamine cells in the midbrain so that the neurons may learn from the new idea. It is at this point the creative idea alters our perceptions and the problem begins to make sense (7).

**Traits of creativity**

Creative thoughts are the result of higher thinking and can be broken down to a combination of traits that promote innovative processes. Some traits which promote creativity are (6):

* **Divergent thinking**

  Free association, and a willingness to allow your mind to go off on interesting and original tangents, play a large role in creativity. Divergent thinking is the opposite of convergent
thinking. In the latter, thoughts are highly specific and directed at finding a narrowly-defined fact or solution to a problem (the one-question one-answer type thinking) (3, 4, 6).

*Top-Down Processing*

Top-down processing makes one highly subjective to information and experiences. Generously encouraging your own personal associations, values, and perspectives actually promotes creativity. While working on an assignment, a top-down student would tweak and modify the parameters of expectations to accommodate for one’s creative energy (3, 4, 6).

*Specialization*

Having a medium to channel one’s creative energy is a common trait in creative individuals. It could be through writing, the arts, or even research (6, 8).

Divergent thinking, top-down processing, and specialization are important engines that drive a creative mind. Our current educational system stresses convergent thinking and shallow comprehension of a wide range of subjects. Such an environment does not provide the ingredients needed to nourish creativity.

**The Stages of Creativity**

**Phase 1: Accumulation of Knowledge:** Creativity usually requires a basic to thorough knowledge prior to creative insight regarding the issue. This is accumulated through investigation and research. Extensive reading, exchanges with experts in the problem, and a general assimilation of knowledge regarding the field. In addition, research in related and unrelated fields is frequently involved. Such exploration provides the individual with diverse perspectives regarding the issue (5).

**Phase 2: The Incubation Period:** Creative individuals allow their subconscious to process the large amounts of information that they accumulated during the preparation phase. This incubation process will occur during activities unrelated to the subject or problem, and especially during sleep. Literally getting away from the problem and allowing the subconscious mind to mull over the issue allows creativity to spring forth (5).

**Phase 3: The Innovative Insight:** This phase, the discovery of the solution, is often mistakenly perceived to be the only component of creativity. Similar to the incubation phase, new and innovative ideas frequently emerge during unrelated activities (i.e., taking a shower, driving on the turnpike, reading a book). In some cases this insight may come abruptly, however, the answer usually forms incrementally. Because it is often difficult to distinguish where the incubation period ends and when the innovative insight is formulated, most people are unaware of their progression from phase 2 to phase 3 (5).
Phase 4: Refinement and Implementation: This is the phase where the individual must refine the rough idea and put the idea to the test of reality. The implementation of your creative idea can be considered to be the most difficult step of any creative endeavor. Difficulties can occur because, depending on the novelty of the idea, you must have the skills, ability to distinguish workable to unworkable ideas, and the perseverance to trudge through--regardless of the obstacles or dissenters your idea may bring (5).

Summing it up:
Our educational system is based on the idea that intelligence and success is predicated on an individual’s ability to do well on standardized tests. While a high GPA and a college degree may have guaranteed a successful career in the past, this no longer holds true today. This change is due to the fact that most educational systems doesn’t necessarily cultivate the skills that our current careers view as valuable. Most careers don’t require the ability to grasp long-winded verbal instructions but a thorough comprehension and a high degree of expertise in a given field, such an environment is where people with short-term memory dysfunction will excel in. Even though a person with a weak working memory may have trouble keeping track of ideas while utilizing the idea, plenty of jobs--such as being a public speaker, lecturer, public relations, and other careers--prefer someone who is charismatic and clearly spoken, which are frequent characteristics of people with weak working memory. In terms of long term memory dysfunction, people with this issue are frequently incredible problem solvers and prolific creative thinkers. These traits are applicable in careers such as researchers, artists, engineers, and etc. Essentially, the careers of today don’t require the all around ability that our educational system strives for. These careers offer niches for individuals that excel in specific aspects of the field.

Thus, instead of relying on the old and outdated educational system, we need to change the system in such a way that a student’s natural talents can be recognized and developed. The solution for this may be to provide a creative environment in the classroom to support peoples’s diverse, multiple intelligences. This is because the best learning is as a creative and playful adventure, in which the individual is constantly exploring novel ways of doing things and pushing the boundaries of what is known. This is different from the bland practices of rote-learning and the mind-numbing adoption study techniques. Because the creativity flourishes in an environment of diverse ideas and views, an environment based on supporting creativity will allow explore their own strengths and weaknesses. And unlike memory, where improving one’s memory will be limited to higher test scores, innovativeness can manifest itself in many ways.

Conclusion:
Unlike our current educational system, where one’s academic success is based on tests which bounds one mentally within specific parameters. The creative process allows unique intelligence, perspectives, and values to thrive. However, before we try to reform the entire system we should attempt to provide such an environment on a smaller scale, such as within an existing course. Although a single course will be insufficient to fully develop the unique talents of each individual, it may spark their creativity and/or provide a chance to explore their strengths and weaknesses. To provide such a dynamic environment, consistent and meaningful feedback from the students to the instructor will be required. Thus, a student-teacher evaluation that could provide the instructor with reliable feedback should be created.

**Creativity Evaluation Form:**
Making an evaluation for the sake of providing a creative and nurturing environment, led me to searching various fields. First, I felt the need to research how past evaluations defined an effective teacher and prior evaluative practices so that I could avoid some of the pitfalls encountered in the past. I also looked at art evaluations, music, writing, science, research, and evaluations attempting to assess creativity in students. These evaluations only proved somewhat useful as my main focus wasn’t to evaluate the student or teacher, but to find reliable questions that could invoke useful feedback from students. Although the different evaluations helped me form the basic foundation of my creative evaluation, I decided that delving into creativity would be much more fruitful. I look at resources covering the neurophysiological sense of creativity and creativity in the field of cognitive neuroscience. But the resource that I found by far the most useful was the book, “Imagine: How Creativity Works” by Jonah Lehrer. Though I initially regarded this book to be another pop culture rendition of current research on creativity, I quickly found how mistaken I was as I found no contradictions between the research I was encountering and the writings of Jonah Lehrer. With both the book and creative research papers, I had enough of an understanding to create and refine the creative evaluation form. With Professor Dr. Fagan’s approval, this evaluation form will be distributed to Spring 2012 students--perhaps even to future students-- in “Ethics in Science” through Sakai.

**References:**


