PEER-LED TEAM LEARNING
LEADER TRAINING

PLTL AND THE EMOTIONAL BRAIN

CHINEDU CHUKUIGWE

"*I've just attended my first chemistry workshop class as a City College student. When I learned chemistry in high school, and as a college student in Nigeria, I did not learn by discussing in-group. It was study at night, "burn your candle" alone, or fail. I'm much excited. I'm in the U.S. Chemistry, I've done a lot of it; I think this is a piece of cake. I'll pull this off. But what is this discussion thing all about?"*

My diary entry: Spring 2002

During the first weeks of the semester the workshops made no sense to me; I only attended because I had to. Worst of all were the quizzes after every workshop session. This was something I wasn't used to. In Nigeria we only had two exams for each course in a semester: the mid-term and the final. There, the strategy for learning was to attend classes (of course one had to be there on time to get a proper seat, or one would have to sit on the stairs, hang by a window, or stand by a door, despite the large rooms in which classes were held), and, study, on one's own, perhaps two days before the exams. Memorize!

I had every intention of keeping the old routine, only this time with more vigor. This strategy had always worked, I thought, until I failed my first test. I was perplexed. "I did not come this far to fail," I kept telling myself. "How do I study for five tests for each course before the end of the semester?" It was so bad that I was advised to drop the course. The professor did not think I stood a chance. I remember showing him my test paper and asking why I had failed a particular problem, which I had answered correctly. However, because of how bad my grade was–even with the correction of that problem–he decided it was pointless to correct it. "Try and know what is going on here," he told me, "if you still think you can hang on." The effect: I, too, became convinced that I could not make it.

It was probably hard for my workshop leader to have a handle on me. I scarcely contributed to the discussions, never adhering to the warnings to take the discussions seriously. But my leader was a tremendous asset. He spent some time out of class to bring me up to speed, and he offered his valuable advice, giving instances from his experiences. Most importantly, he asked me to be less anxious and less tentative in my studies.

I took the next test and anticipated the result like a "Pavlovian conditioned dog." The day I saw the results I remember going home with a friend, agonizing: "I should have done this; I should have done that," (damn stoichiometry!). My grade: 75. Since I lived in the same area as my friend, we would always study together and talk about chemistry as we went home. In the long run, the discussions, and the repeated quizzes (more on this later), were what helped me do well on the next exams (97 and the like). Now it's my turn–for four semesters I have been a peer leader for two chemistry courses, and most recently for a new pilot project for physics–and sometimes I am taken aback by the reactions of my

students: oblivious, taciturn, and bored, to mention a few. Sometimes I wonder why I am able to get the attention of some and not others; why some are able to communicate and others not; and why some try as best they can to improve their skills while others do not.

In order to foster communication and attentiveness in the workshop setting, peer leaders have applied several methods–the round robin technique, for example, which has proved helpful. Effective communication, however, requires each student to be somewhat familiar with the material being discussed. Thus it is necessary that every student be prepared for each session by reading the text and attempting the pre-workshop assignment. In terms of student preparedness, the most effective method has been the introduction of quizzes after every workshop session. But some faculty and peer leaders oppose the idea of quizzes ostensibly because some students are anxious test-takers. This explanation undermines the mind's power of choice, of self-determination, and of adaptation. In that sense, then, the thrust of this article is to make a scientific contribution to the discussion by suggesting to readers a shift of viewpoint, a new take on this familiar phenomenon of "brain fixity."

In the late 1970's important studies of emotions in the brain were begun by, among others, Joseph LeDoux, now a professor at New York University. LeDoux showed that the amygdala, an almond-shaped structure located around the middle of the brain, is responsible for the regulation of fear in the brain. The amygdala has two neural pathways through which it receives external stimuli: one is quick and animalistic, while the other is slower and encodes more information. First, the amygdala receives the quick information from the thalamus and within milliseconds activates the nearby hypothalamus, which in turn activates motor systems that trigger the "fight-or-flight" response. Second, the amygdala receives the same information, but with more detail, from the visual cortex, allowing for a better analysis of the situation. A strong memory of the situation that cannot be erased is stored by the amygdala.

A patient whose amygdala has been damaged either by therapeutic surgery or brain injury shows impairment to such emotional arousal. But a person with an intact amygdale is subject to the regulations of this "hub in the wheel of our emotions," LeDoux's term for the amygdala. You might freeze at the sight of a dog–heart beating, palms sweating–then, after a few milliseconds, you decide whether to fight the dog or flee. Such is the absurdity of fear in the brain–a primitive system that evolved to foster survival in threatening environments.

Because of how abstract the human mind is, researchers have not as yet been able to decipher all that they would like to know about the neural circuits that underlie more complex fear-related behaviors such as the fear of failure. But a person could learn to fear failure by a mere experience of failure. "It's not that there's no learning involved," LeDoux told me in a recent interview. "It's just that in order to comprehend the fear of failure…you have to have a brain that is capable of very complex representations of events." The fear of failure, researchers believe, is rooted in the same physiology as described above. Thus, a student can be conditioned to fear tests by a past experience of failure.

At the PLTL National Leadership Conference in October 2003, the student leaders discussed the fear of failure and the effects of the weekly quizzes on those who "freeze at the sight of a test paper," to put it in the terms of one of the visiting faculty participants. Some participants argued against the quizzes while others argued that it was necessary to keep students alert during a workshop session. However, as we have seen above, a student's brain can learn to fear failure because of a past experience of failure. This

can lead to the lack of interest in studying that can in turn result in more failure. In a situation such as this–as with anxiety, if one could separate these–the amygdale hijacks the brain, rerouting other brain activities to respond to the emotional situation at hand. Consequently, the prefrontal cortex–which is crucial for the function of working memory–is inhibited, making it harder for the student to concentrate on the test. (The connection between the functions of the amygdala and the prefrontal cortex is sort of like a check and balance system–the prefrontal cortex is inhibited by the amygdala, and vice versa.) Dr. LeDoux has demonstrated that if one exposes a rat to a shock and a sound at the same time, the rat learns to fear the sound even without the shock being administered. The usual response is freezing. But if the rat learns that by taking a step it can pass the shock area, it does exactly that to get out of that trouble. Scientists have shown that the same goes for humans.

Some psychologists treat phobias and other anxiety-related disorders by continually exposing the patient to the same type of stimuli that caused the fear in the first place. Dr. David Barlow, of Boston University's Center for Anxiety and Related Disorders, calls it "talking to them that high places can be safe," taking them to the top of a skyscraper so that they can live to remember that they survived can be effective. The neural logic: surviving such an experience several times enables the neurons in the cortex to form new memories that compete with the primitive ones directed by the amygdala. Perhaps Barlow would suggest that students who fear exams should be exposed to more tests.

What if a student continues to fail? One way to reduce–perhaps eliminate–failure in the workshop setting is by repeatedly calling attention to the concepts of the material that are important to remember. Students should solve problems that require such concepts; they should ask questions as much as is necessary for them. In my experience of leading workshops, I have discovered that this is an effective method for sustaining students' attention.

A few weeks ago, after thinking about some literature in preparation for this article, I decided to test my hypothesis. I came to the workshop session and distributed the review sheets that I had been given earlier by my coordinator. It was supposed to be a review session, but I told the students this was a test to check how prepared they were for the test that was coming up the following Monday. The only difference was that I told them, "it's an open book test, and you can discuss the test in your group." This workshop group, one of the most reserved groups I have worked with, communicated better than they had ever done before and it turned out to be a very productive session. Yes, they may be anxious and may tend to pay attention only to those concepts that are relevant to the test, but, as is the case at City College, the quizzes cover just about all that is done in a workshop session. As a student, and in my experience as a workshop leader, I have found that to be a little anxious is somewhat helpful. "There's an optimal level of emotional arousal that facilitates learning and memory," says LeDoux, "If you have no anxiety, you don't care about [a] test, you don't study, you don't learn. [But] if you are too anxious then you'll perform poorly."

When I met LeDoux in his office, he talked about the relationship between anxiety and mental performance, the inverted U-shaped graph, now classical literature in psychology. At the top of the inverted U is the optimal level of anxiety that a student, and certainly every individual, can have to enhance performance. On the contrary, someone with an anxiety level at the bottom of the left side of the U shows too little incentive to try hard enough to do well; while the bottom right side, too much

anxiety, would interfere with the attempt to perform well. Therefore, "…in the group situation," LeDoux said, "…you have to do two things. One, you have to reduce the negative emotions, because if [students] are nervous about talking in the group then they're not going to participate well. [Two] …you also want to facilitate the positive emotions in the group interactions."

My most profound confirmation of the need for the quizzes has come from my own educational experience. I have taken several classes that require recitation sections, but I benefited more from those that required quizzes after every workshop section. They were most helpful because what I saw in the quizzes was somewhat similar to what I saw in the exams. The quizzes can instigate students to study before they attend a workshop section. And, studying before a class makes one more alert to grasp the material more easily.

While the brain is computational, nonetheless, according to LeDoux, "any thought that is worth remembering has an emotional content, and it's almost impossible to have an emotion without some perceptual and other cognitive input…." What, other than "talking to the amygdala," can one do to help students overcome their fear of exams? Indeed, as Goethe wrote in his last letter, "the Ancients said that the animals are taught through their organs; let me add to this, so are men, but they have the advantage of teaching their organs in return." Through education, experience, and life, we teach our brains to be less archaic. Thus, we could help students to be less subject to the primitive regulations of the amygdala by administering a quiz after every workshop section. I'd love to keep rattling; but I have to go and study, so that I can sit for my exams, and live to remember that I passed.

Chinedu Chukuigwe
Peer Leader
The City College of New York/CUNY

Dedicated to my father, Chief S.Y. Chukuigwe.

For more information

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