

A Neuroscience-Based Learning Technique: Framework and Application to STEM

Authors : Dante J. Dorantes-González, Aldrin Balsa-Yepes

Abstract : Existing learning techniques such as problem-based learning, project-based learning, or case study learning are learning techniques that focus mainly on technical details, but give no specific guidelines on learner's experience and emotional learning aspects such as arousal salience and valence, being emotional states important factors affecting engagement and retention. Some approaches involving emotion in educational settings, such as social and emotional learning, lack neuroscientific rigorousness and use of specific neurobiological mechanisms. On the other hand, neurobiology approaches lack educational applicability. And educational approaches mainly focus on cognitive aspects and disregard conditioning learning. First, authors start explaining the reasons why it is hard to learn thoughtfully, then they use the method of neurobiological mapping to track the main limbic system functions, such as the reward circuit, and its relations with perception, memories, motivations, sympathetic and parasympathetic reactions, and sensations, as well as the brain cortex. The authors conclude explaining the major finding: The mechanisms of nonconscious learning and the triggers that guarantee long-term memory potentiation. Afterward, the educational framework for practical application and the instructors' guidelines are established. An implementation example in engineering education is given, namely, the study of tuned-mass dampers for earthquake oscillations attenuation in skyscrapers. This work represents an original learning technique based on nonconscious learning mechanisms to enhance long-term memories that complement existing cognitive learning methods.

Keywords : emotion, emotion-enhanced memory, learning technique, STEM

Conference Title : ICSETRO 2020 : International Conference on Science Education, Technology and Research Opportunities

Conference Location : Prague, Czechia

Conference Dates : March 19-20, 2020