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An EEG Study on Students' Learning in Practical and Theory-Based Hospitality Courses

Liwei Hsu, National Kaohsiung University of Hospitality and Tourism, Taiwan
Yen-Jung Chen, National Kaohsiung University of Hospitality and Tourism, Taiwan

ABSTRACT

This study investigates neural activities of hospitality students when they are in practical and theoretical classes. This study involved 33 freshmen in a hospitality program, who underwent 420 minutes of brainwave data collection using an electroencephalographic (EEG) headset; 831,600 brainwave data points were gathered in seconds. The results show that participants' level of meditation was significantly higher than their level of attention in both classes. Among the five brainwaves, delta, theta, alpha, and beta waves (but not gamma waves) demonstrated significant differences in power spectra of students' brains between practical and theoretical classes. The relevance of learning outcomes to brain activity was also different between the two classes, which suggests that teachers must use different strategies to stimulate students' learning. From the perspective of educational neuroscience, this study produces more empirical evidence on and understanding of the neural nature of hospitality learning and general learning, with implications for teaching.

KEYWORDS

Attention, Brainwave, Electroencephalography (EEG), Hospitality Program, Meditation, Practical Courses, Theoretical Courses

INTRODUCTION

Vocational education emphasizes the connection between curriculum and industry needs and focuses on the development of industry-related skills (Hsu, 2017). Curriculum design in vocational education is divided into theoretical courses and practical courses, and the emphasis must be placed on both (Liu, Huang, & Zhang, 2016). When students' theoretical foundation is consolidated, their ability to use professional knowledge will

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be enhanced (Liu & Chen, 2017); meanwhile, practical courses focus on cultivating students' practical operation ability to gain an in-depth understanding and mastery of the skills required for their future career through practical exercises (Wang & Zhang, 2016; Zhong & Li, 2016). Hospitality education, as a part of vocational education, is no exception, and also aims to equip students with theoretical knowledge and practical skills (Nyanjom & Wilkins, 2016). To develop different types of knowledge, teachers need to provide different stimuli to their learners, to facilitate their transformation and enable the preservation of learning content in the memory system, in order to become meaningful knowledge (Hsu, 2017; Harrison, Andrews, & Saklofske, 2003). Teachers need to know the states of mind of their students while learning different subjects because learners' mindful engagements with the materials are essential to the learning process (Langer, 2000). Yildirim and Varol (2013) noted that the level of attention and meditation of learners are important indicators of their states of mind while learning. The scope of understanding the state of mind of learners while learning through educational neuroscience has been widely recognized in education and among cross-disciplinary experts and scholars in recent years (Devor et al., 2013; Frobakk, 2017; Immordino-Yang, 2010; Kelly, 2017; Palghat, Horvath, & Lodge, 2017).

Holmes (2019) noted that neuroscience provides education researchers and practitioners with new insights into how humans learn things. From the perspective of educational neuroscience, learning is represented by? A series of neural activities in the brain (Campbell, 2011; Frobakk, 2017; Jensen, 2008). Scholars such as Fischer, Daniel, Immordino-Yang, Stern, Battro, and Koizumi (2007), Goswami (2006), and Stern (2005) have proposed 'Mind Science', or 'Cognitive Neuroscience' as the conceptual framework for a 'Brain-Based Program'. They show that by applying this concept in the classroom, the quality and effectiveness of teaching will improve. These studies have made the brain and mental activities that were previously difficult to understand, observable and capable of being recorded directly through the use of techniques such as the Electroencephalograph (EEG), Transcranial Magnetic Stimulation (TMS), and Functional Magnetic Resonance Imaging (fMRI) (Gazzaniga, Ivry, & Mangun, 2009; Lee at al., 2019). EEG can serve as a window to one's state of mind (Nunez & Srinivasan, 2006; Teixeira, Tomé, Roseiro, & Gomes, 2018) and a growing body of research has been done with brainwave analysis through EEG (Tinga, de Back, & Louwerse, 2019; Xu & Zhong, 2018). Michel and Brunet (2019) noted that the EEG is a powerful tool to measure the brain function in a timely manner. An increasing number of researchers are using brainwave data in education-related research; however, research is still relatively scarce not only on the use of portable brainwave instruments in education but also on using EEG to monitor students' learning in actual classroom environments (Xu & Zhong, 2018). Because of the limitations described above, there is still room for development in educational neuroscience research (Devor et al., 2013; Frobakk, 2017; Immordino-Yang, 2010; Kelly, 2017; Palghat, Horvath, & Lodge, 2017). Moreover, most of the current discussion in hospitality education focuses on the literature and theoretical criticism (Lugosi & Jameson, 2017).

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